

Department of Chemistry and Biochemistry

Morton E. Munk
Chair
(PS D102) 602/965-3461

REGENTS' PROFESSORS

BUSECK, C. MOORE, PETTIT

PROFESSORS

ANGELL, BALASUBRAMANIAN,
BIEBER, BIRK, BLANKENSHIP,
T. BROWN, CRONIN, FUCHS,
GLAUNSINGER, GLICK, GUST,
HOLLOWAY, LOHR, McMILLAN,
T. MOORE, MUNK, O'KEEFFE,
ROSE, SKIBO, WILLIAMS

ASSOCIATE PROFESSORS

ALLEN, A. MOORE, PETUSKEY,
STEIMLE, WOLF,
WOODBURY, ZIURYS

ASSISTANT PROFESSORS

GROTJAHN, KOUVETAKIS,
PENA, YAGHI

REGENTS' PROFESSORS EMERITI

EYRING, WAGNER

PROFESSORS EMERITI

D. BROWN, BURGOYNE, HARRIS,
JUVET, LIU, LUCHSINGER,
MOELLER, STUTSMAN, THOMSON,
WHITEHURST, ZASLOW

CHEMISTRY—B.A.

The B.A. in Chemistry consists of 46 semester hours, of which 30 must be in chemistry and 16 in closely related fields. Required courses are as follows:

Choose between the two combinations
of courses below.....9

- CHM 113 General Chemistry
SI/S2 (4)
CHM 115 General Chemistry with
Qualitative Analysis
SI/S2 (5)

— or —

- CHM 117 General Chemistry
for Majors I* *SI/S2* (4)
CHM 118 General Chemistry
for Majors II* *SI/S2* (5)

- CHM 325 Analytical Chemistry.....3
CHM 326 Analytical Chemistry
Laboratory2

Choose between the two combinations
of courses below.....9 or 8

- CHM 317 Organic Chemistry
for Majors I* (3)
CHM 318 Organic Chemistry
for Majors II* (3)
CHM 319 Organic Chemistry
Laboratory for
Majors I* (1)
CHM 320 Organic Chemistry
Laboratory for
Majors II* (2)

— or —

- CHM 331, 332 General Organic
Chemistry (6)
CHM 335, 336 General Organic
Chemistry
Laboratory (2)

- CHM 341 Elementary Physical
Chemistry3
CHM 343 Physical Chemistry
Laboratory1
CHM 453 Inorganic Chemistry.....3

*CHM 117, 118, 317, 318, 319, and 320 are
strongly recommended for qualified stu-
dents.

Related courses must include the fol-
lowing:

- MAT 270 Calculus with Analytic
Geometry I¹ *NI* 4
MAT 271 Calculus with Analytic
Geometry II¹ 4
PHY 111, 112 General Physics²
*SI/S2*³ 6
PHY 113, 114 General Physics
Laboratory² *SI/S2*³ 2

¹ Equivalent courses may be taken in place
of MAT 270 and 271.

² More advanced PHY courses may be taken
in place of PHY 111, 112, 113, and 114.

³ Both PHY 111 and 113 or PHY 112 and
114 must be taken to secure S1 or S2
credit.

The remaining courses to complete
the major are determined by students in
consultation with their advisors.

CHEMISTRY—B.S.

The program consists of 42 semester
hours in chemistry. Required courses
are as follows:

Choose between the two combinations
of courses below.....9

- CHM 113 General Chemistry
SI/S2 (4)
CHM 115 General Chemistry with
Qualitative Analysis
SI/S2 (5)

— or —

- CHM 117 General Chemistry for
Majors I¹ *SI/S2* (4)
CHM 118 General Chemistry for
Majors II¹ *SI/S2* (5)

Choose between the two combinations
of courses below.....9 or 8

- CHM 317 Organic Chemistry
for Majors I¹ (3)
CHM 318 Organic Chemistry
for Majors II¹ (3)
CHM 319 Organic Chemistry
Laboratory for
Majors I¹ (1)
CHM 320 Organic Chemistry
Laboratory for
Majors II¹ (2)

— or —

- CHM 331, 332 General Organic
Chemistry (6)
CHM 335, 336 General Organic
Chemistry
Laboratory (2)

Additional required chemistry
courses:

- CHM 325 Analytical Chemistry.....3
CHM 326 Analytical Chemistry
Laboratory2
CHM 421 Instrumental Analysis.....3
CHM 422 Instrumental Analysis
Laboratory1
CHM 441, 442 General Physical
Chemistry.....6
CHM 444 General Physical Chemistry
Laboratory *L2*² 2
CHM 452 Inorganic Chemistry
Laboratory *L2*² 1–2
CHM 453 Inorganic Chemistry.....3

Choose between the two combinations
of courses below.....12 or 10

- MAT 270 Calculus with Analytic
Geometry I *NI* (4)
MAT 271 Calculus with Analytic
Geometry II (4)
MAT 272 Calculus with Analytic
Geometry III (4)
MAT 274 Differential Equations (3)

— or —

- MAT 274 Differential Equations (3)
MAT 290 Calculus I *NI*(5)
MAT 291 Calculus II (5)

Additional required related field
courses:

- PHY 121 University Physics I:
Mechanics *SI/S2*³ 3
PHY 122 University Physics
Laboratory I *SI/S2*³ 1
PHY 131 University Physics II:
Electricity and
Magnetism *SI/S2*⁴ 3
PHY 132 University Physics
Laboratory II *SI/S2*⁴ 1

PHY 241 University Physics III:
Thermodynamics, Optics,
and Wave Phenomena3

¹ CHM 117, 118, 317, 318, 319, and 320 are strongly recommended for qualified students.

² Both CHM 444 and 452 must be taken to secure L2 credit.

³ Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

⁴ Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

Strongly recommended is an appropriate course in computer language, such as CSE 181 Applied Problem Solving with BASIC or CSE 183 Applied Problem Solving with FOR-TRAN.

The remaining chemistry courses to complete the major are determined by the student in consultation with an advisor. With the consent of the department chair, selected advanced courses from other related scientific disciplines may be accepted in lieu of elective chemistry courses to complete the major.

Transfer students are interviewed and advised of possible preparatory work. They must contact the department to arrange for the interview in advance of registration. See "Degree Requirements," page 107.

American Chemical Society Certification. A student who satisfactorily completes the Bachelor of Science degree program is certified by the Department of Chemistry and Biochemistry to the American Chemical Society (ACS) as having met the specific requirements for undergraduate professional training in chemistry. Graduates meeting ACS guidelines can receive a certificate to indicate this fact.

Emphasis in Biochemistry. The major in Chemistry with an emphasis in biochemistry consists of 38 semester hours in chemistry plus work in related fields. Required courses are as follows:

BIO 181 General Biology *SI/S2* 4
BIO 182 General Biology *S2* 4
BIO 340 General Genetics4

Choose between the two combinations of courses below.....8 or 9

CHM 113 General Chemistry
SI/S2 (4)

CHM 116 General Chemistry
SI/S2 (4)
or CHM 115 General
Chemistry with Qualitative
Analysis *SI/S2* (5)

CHM 117 General Chemistry
for Majors I¹ *SI/S2* (4)

CHM 118 General Chemistry
for Majors II¹ *SI/S2* (5)

Choose between the two combinations of courses below.....15 or 12

CHM 317 Organic Chemistry for
Majors I (4)

CHM 318 Organic Chemistry
for Majors II (5)

CHM 319 Organic Chemistry
Laboratory for
Majors I (1)

CHM 320 Organic Chemistry
Laboratory for
Majors II (2)

CHM 331, 332 General Organic
Chemistry (6)

CHM 335, 336 General Organic
Chemistry
Laboratory (6)

Choose between the two combinations of courses below.....8

CHM 341 Elementary Physical
Chemistry (3)

CHM 463 Biophysical Chemistry (3)

CHM 464 Biophysical Chemistry
Laboratory *L2*² (2)

CHM 441, 442 General Physical
Chemistry (6)

CHM 444 General Physical
Chemistry
Laboratory *L2*³ (2)

Additional required chemistry courses:

CHM 325 Analytical Chemistry.....3

CHM 453 Inorganic Chemistry.....3

CHM 461, 462 General Biochemistry ..6

CHM 467 General Biochemistry
Laboratory *L2*² 2

Choose between the two combinations of courses below.....12 or 10

MAT 270 Calculus with Analytic
Geometry I *NI* (4)

MAT 271 Calculus with Analytic
Geometry II (4)

MAT 272 Calculus with Analytic
Geometry III (4)

CHM 290 Calculus I *NI* (5)

MAT 291 Calculus II (5)

Additional required related field courses:

PHY 121 University Physics I:
Mechanics *SI/S2*⁴ 3

PHY 122 University Physics
Laboratory I *SI/S2*⁴ 1

PHY 131 University Physics II:
Electricity and
Magnetism *SI/S2*⁵ 3

PHY 132 University Physics
Laboratory II *SI/S2*⁵ 1

¹ CHM 117 and 118 are strongly recommended for qualified students.

² Both CHM 464 and 467 must be taken to secure L2 credit.

³ Both CHM 444 and 452 must be taken to secure L2 credit.

⁴ Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

⁵ Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

The remaining courses to complete the major are determined by students in consultation with their advisors.

MINOR IN CHEMISTRY AND BIOCHEMISTRY

A minor in Chemistry and Biochemistry is awarded to students who complete a minimum of 24 hours of chemistry courses. Required courses are as follows:

CHM 113 General Chemistry¹ *SI/S2*..... 4

CHM 115 General Chemistry with
Qualitative Analysis *SI/S2* 5
or CHM 116 General
Chemistry *SI/S2* (4)

Choose between the two combinations of courses below.....4 or 5

CHM 325 Analytical Chemistry (3)

CHM 326 Analytical Chemistry
Laboratory (2)

or

CHM 421 Instrumental Analysis (3)

CHM 422 Instrumental Analysis
Laboratory (1)

Choose between the two combinations of courses below.....7 or 8

CHM 231 Elementary Organic
Chemistry *SI/S2*² (3)

CHM 235 Elementary Organic
Chemistry Laboratory
*SI/S2*² (1)

CHM 361 Principles of
Biochemistry (3)

or

- CHM 331, 332 General Organic Chemistry (6)
 CHM 335, 336 General Organic Chemistry Laboratory (2)

Choose between the two combinations of courses below.....4 or 8

- CHM 341 Elementary Physical Chemistry¹ (3)
 CHM 343 Physical Chemistry Laboratory¹ (1)

— or —

- CHM 441, 442 General Physical Chemistry (6)
 CHM 444 General Physical Chemistry Laboratory L2³ (2)

¹ Equivalent courses may be taken in place of CHM 113, 115 or 116, 341, and 343.

² Both CHM 231 and 235 must be taken to secure S1 or S2 credit.

³ Both CHM 444 and 452 must be taken to secure L2 credit.

SECONDARY EDUCATION— B.A.E.

Chemistry. Students may pursue one of two options for the chemistry major teaching field.

Option One. The academic specialization consists of 48 semester hours in chemistry and related fields. Required courses are as follows:

- CHM 113 General Chemistry S1/S2..... 4
 CHM 115 General Chemistry with Qualitative Analysis S1/S2 5
 CHM 325 Analytical Chemistry.....3
 CHM 326 Analytical Chemistry Laboratory2
 CHM 331, 332 General Organic Chemistry.....6
 CHM 335, 336 General Organic Chemistry Laboratory..6
 CHM 341 Elementary Physical Chemistry3
 or CHM 441, 442 General Physical Chemistry (6)
 CHM 361 Principles of Biochemistry3
 CHM 480 Methods of Teaching Chemistry3
 or PHY 480 Methods of Teaching Physics (3)
 MAT 270 Calculus with Analytic Geometry I NI..... 4
 MAT 271 Calculus with Analytic Geometry II4
 PHY 111, 112 General Physics S1/S2*6
 PHY 113, 114 General Physics Laboratory S1/S2*.....2

*Both PHY 111 and 113 or PHY 112 and 114 must be taken to secure S1 or S2 credit.

The remaining courses to complete the specialization are determined by students in consultation with their advisors.

Option Two. The academic specialization consists of 31 semester hours of chemistry, which includes all of the required chemistry courses listed in option one and selection of the corresponding option in either mathematics or physics, that is, completion of an additional 30 semester hours in the chosen area as specified by the department selected.

The minor teaching field consists of 24 semester hours in chemistry. Required courses are as follows:

- CHM 113 General Chemistry S1/S2..... 4
 CHM 115 General Chemistry with Qualitative Analysis S1/S2 5

Choose between the two combinations of courses below.....11 or 12

- CHM 231 Elementary Organic Chemistry S1/S2* (3)
 CHM 325 Analytical Chemistry (3)
 CHM 326 Analytical Chemistry Laboratory (2)
 CHM 361 Principles of Biochemistry (3)

— or —

- CHM 331, 332 General Organic Chemistry (6)
 CHM 335, 336 General Organic Chemistry Laboratory (6)

- CHM 341 Elementary Physical Chemistry3

*Both CHM 231 and 235 must be taken to secure S1 or S2 credit.

The remaining courses to complete the specialization are determined by students in consultation with their advisors.

GRADUATE PROGRAMS

The Department of Chemistry and Biochemistry offers programs leading to the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees. Consult the *Graduate Catalog* for requirements.

The department participates in the interdisciplinary program for the M.S. and Ph.D. degrees in Molecular and Cellular Biology. See page 172 for courses. For more information, contact Bonnie Engel, PS D121, 602/965-0743.

CHEMISTRY

CHM 101 Introductory Chemistry. (4) F, S, SS

Elements of general chemistry. Adapted to the needs of students in nursing, home economics, agriculture, and physical education. Recommended for general studies credit. Normally followed by CHM 231. 3 hours lecture, 1 hour discussion, 2 hours lab. Credit is allowed for *only* CHM 101, 113, 114, or 117. *General Studies: S1/S2.*

113 General Chemistry. (4) F, S, SS

Principles of chemistry. Adapted to the needs of students in the physical, biological, and earth sciences. 3 hours lectures, 1 hour discussion, 2 hours lab. 1 year of high school chemistry recommended. Credit is allowed for *only* CHM 101, 113, 114, or 117. Prerequisite: MAT 106 or 3 semesters of high school algebra. *General Studies: S1/S2.*

114 General Chemistry for Engineers. (4) F, S

One semester college chemistry with emphasis toward engineering. 3 hours lecture, 1 hour discussion, 2 hours lab. Students without high school chemistry or chemical engineering majors must enroll in the CHM 113, 116 sequence instead of CHM 114. Credit is allowed for *only* CHM 101, 113, 114, or 117 and for *only* CHM 114, 115, 116, or 118. Prerequisites: MAT 106 or 3 semesters of high school algebra; 1 year of high school chemistry. *General Studies: S1/S2.*

115 General Chemistry with Qualitative Analysis. (5) F, S, SS

Continuation of CHM 113. Equilibrium theory, chemistry of metals, nonmetals, and metalloids and the introduction to organic chemistry. Laboratory includes qualitative analysis. 3 hours lecture, 2 hours discussion, 4 hours lab. Credit is allowed for *only* CHM 114, 115, 116, or 118. Prerequisite: CHM 113 or 2 years of high school chemistry. *General Studies: S1/S2.*

116 General Chemistry. (4) F, S

Continuation of CHM 113. Equilibrium theory, chemistry of metals, nonmetals, and metalloids and the introduction to organic chemistry. 3 hours lecture, 1 hour discussion, 2 hours lab. Credit is allowed for *only* CHM 114, 115, 116, or 118. Prerequisite: CHM 113 or 2 years of high school chemistry. *General Studies: S1/S2.*

117 General Chemistry for Majors I. (4) F

Atomic and molecular structure, properties and physical states of matter, thermodynamics, kinetics, acids and bases, chemical analysis, and stoichiometry. 3 hours lecture, 1 conference, 2 hours lab. Credit is allowed for *only* CHM 101, 113, 114, or 117. Prerequisites: minimum of 1 year each of high school chemistry (with a grade of "B" or better) and physics; 3 years of high school mathematics. *General Studies: S1/S2.*

118 General Chemistry for Majors II. (5) S

Continuation of CHM 117. 3 hours lecture, 1 conference, 5 hours lab. Credit is allowed for *only* CHM 114, 115, 116, or 118. Prerequisite: CHM 117. Corequisite: MAT 270 or 290. *General Studies: S1/S2.*

- 231 Elementary Organic Chemistry.** (3) F, S Survey of organic chemistry, with emphasis on the reactivity of basic functional groups. Credit is allowed for *only* CHM 231, 317, or 331. Prerequisite: CHM 101 or 114 or 115 or 116 or 117 or 1 year of high school chemistry with grades of "A" or "B" or instructor approval. *General Studies: S1/S2 (if credit also earned in CHM 235).*
- 235 Elementary Organic Chemistry Laboratory.** (1) F, S Organic chemistry experiments in synthesis, purification, analysis, and identification. Lab. Pre- or corequisite: CHM 231. *General Studies: S1/S2 (if credit also earned in CHM 231).*
- 301 Chemistry and Society.** (3) S A qualitative survey of chemistry and its impact on modern technology and the environment. May not be counted toward the chemistry major.
- 302 Environmental Chemistry.** (3) S Explores major environmental issues, problems, and solutions from analytical and chemistry perspectives. Prerequisites: CHM 114 (or 115 or 116 or 118), 231 (or 331).
- 317 Organic Chemistry for Majors I.** (3) F Structures, reaction mechanisms and kinetics, and systematic syntheses of organic compounds. Credit is allowed for *only* CHM 231, 317, or 331. Prerequisite: CHM 115 or 118. Corequisite: CHM 319.
- 318 Organic Chemistry for Majors II.** (3) S Continuation of CHM 317. Credit is allowed for *only* CHM 318 or 332. Prerequisite: CHM 317. Corequisite: CHM 320.
- 319 Organic Chemistry Laboratory for Majors I.** (1) F Emphasis on mechanisms, kinetics, and products of organic reactions. 1 conference, 3 hours lab. Credit is allowed for *only* CHM 319 or 335. Pre- or corequisite: CHM 317.
- 320 Organic Chemistry Laboratory for Majors II.** (2) S Continuation of CHM 319. 1 conference, 7 hours lab. Credit is allowed for *only* CHM 320 or 336. Prerequisite: CHM 319. Corequisite: CHM 318.
- 325 Analytical Chemistry.** (3) F, S Principles and methods of chemical analysis. Prerequisite: CHM 115 or 116.
- 326 Analytical Chemistry Laboratory.** (2) F, S Experiments in chemical analysis. 1 conference, 5 hours lab. Corequisite: CHM 325.
- 331 General Organic Chemistry.** (3) F, S, SS Chemistry of organic compounds. Credit is allowed for *only* CHM 231, 317, or 331. Prerequisite: CHM 115 or 116 or 118.
- 332 General Organic Chemistry.** (3) F, S, SS Continuation of CHM 331. Credit is allowed for *only* CHM 318 or 332. Prerequisite: CHM 331.
- 335 General Organic Chemistry Laboratory.** (1) F, S, SS Microscale organic chemical experiments in separation techniques, synthesis, analysis and identification, and relative reactivity. 4 hours lab. Credit is allowed for *only* CHM 319 or 335. Corequisite: CHM 331.
- 336 General Organic Chemistry Laboratory.** (1) F, S, SS Continuation of CHM 335. 4 hours lab. Credit is allowed for *only* CHM 320 or 336. Prerequisite: CHM 335. Corequisite: CHM 332.
- 341 Elementary Physical Chemistry.** (3) F Thermodynamics, equilibrium, states of matter, solutions, and chemical kinetics. For students in premedical, biological, and educational curricula. Not open to students who have taken CHM 441. Prerequisites: CHM 114 (or 118 or 325), 231 (or 331); MAT 271.
- 343 Physical Chemistry Laboratory.** (1) F Physical chemistry experiments. 1 hour conference, 3 hours lab. Credit is allowed for *only* CHM 343 or 444. Corequisite: CHM 341 or 441.
- 361 Principles of Biochemistry.** (3) F, SS Structures, properties, and functions of proteins, enzymes, nucleic acids, carbohydrates, and lipids; the utilization and synthesis of these materials by living systems, and the relationship of these processes to energy production and utilization. Not open to students who have taken CHM 461. Credit is allowed for *only* CHM 361 or 461. Prerequisite: CHM 231 or 318 or 332.
- 367 Elementary Biochemistry Laboratory.** (1) F, SS Qualitative/quantitative analyses of constituents of biological systems, enzyme activity measurements and metabolic studies. 1 hour conference, 3 hours lab. Pre- or corequisite: CHM 361 or instructor approval.
- 392 Introduction to Research Techniques.** (1–3) F, S, SS Instrumental methods and philosophy of research by actual participation in chemical research projects. May be repeated for a total of 6 semester hours. Prerequisites: approvals of advisor and research supervisor.
- 421 Instrumental Analysis.** (3) S Principles of instrumental methods in chemical analysis. Electroanalytical and optical techniques. Prerequisites: CHM 325, 326. Pre- or corequisite: CHM 442.
- 422 Instrumental Analysis Laboratory.** (1) S Experiments in chemical analysis by electroanalytical and optical techniques. 3 hours lab. Corequisite: CHM 421.
- 424 Separation Methods and Quantitative Organic Analysis.** (3) N Theory and practice of gas, liquid, ion-exchange, and gel permeation chromatography, countercurrent distribution, electrophoresis, and distillation; qualitative and quantitative interpretation of IR, mass, and NMR spectroscopy; quantitative methods of organic analysis via functional groups. 2 hours lecture, 4 hours lab. Prerequisites: CHM 318 or 332 or 442 or instructor approval.
- 431 Qualitative Organic Analysis.** (3) S Systematic identification of organic compounds. 1 hour lecture, 6 hours lab. Prerequisites: CHM 118 (or 326) and 320 (or 336) or instructor approval.
- 441 General Physical Chemistry.** (3) F Laws of thermodynamics and their applications, properties of gases, solids, liquids and solutions, reaction kinetics, wave mechanics, molecular spectroscopy, and statistical thermodynamics. Credit is allowed for *only* CHM 341 or 441. Prerequisites: MAT 272 or 291; PHY 252. Corequisite: MAT 274.
- 442 General Physical Chemistry.** (3) S Continuation of CHM 441. Prerequisite: CHM 441; MAT 274.
- 444 General Physical Chemistry Laboratory.** (2) S Physical chemical experiments. 1 conference, 5 hours lab. Credit is allowed for *only* CHM 343 or 444. Prerequisite: CHM 441. *General Studies: L2 (if credit also earned in CHM 452).*
- 452 Inorganic Chemistry Laboratory.** (1–2) S Preparation and characterization of typical inorganic substances, emphasizing methods and techniques. 1 conference, 5 hours lab. Prerequisite: instructor approval. *General Studies: L2 (if credit also earned in CHM 444).*
- 453 Inorganic Chemistry.** (3) S Principles and applications of inorganic chemistry. Prerequisite: CHM 341 or 441.
- 461 General Biochemistry.** (3) F Structure, chemistry, and metabolism of biomolecules and their role in the biochemical processes of living organisms. Credit is allowed *only* for CHM 361 or 461. Prerequisites: CHM 318 (or 332) and 341 (or 441) or instructor approval.
- 462 General Biochemistry.** (3) S Continuation of CHM 461. Prerequisite: CHM 461 or instructor approval.
- 463 Biophysical Chemistry.** (3) S Principles of physical chemistry as applied to biological systems. Prerequisite: CHM 341 or 441.
- 464 Biophysical Chemistry Laboratory.** (2) S Introduction to physical methods in modern biochemistry. Corequisite: CHM 463. *General Studies: L2 (if credit also earned in CHM 467).*
- 467 General Biochemistry Laboratory.** (2) S The application of modern chemical and physical methods to biochemical problems; purification and characterization of biological macromolecules; quantitative measurement of enzyme activity and properties; evaluation of metabolic processes. 1 conference, 5 hours lab. Prerequisite: CHM 461. *General Studies: L2 (if credit also earned in CHM 464).*
- 471 Solid State Chemistry.** (3) F Crystal chemistry, thermodynamics and electrochemistry of solids, nonstoichiometric compounds, diffusion and solid state reactions, crystal growth, and selected topics. Pre- or corequisite: CHM 441 or instructor approval.
- 480 Methods of Teaching Chemistry.** (3) S Organization and presentation of appropriate content of chemistry; preparation of reagents, experiments, and demonstrations; organization of stock rooms and laboratories; experience in problem solving. Prerequisite: instructor approval.
- 481 Geochemistry.** (3) F Origin and distribution of the chemical elements. Geochemical cycles operating in the earth's atmosphere, hydrosphere, and lithosphere. Cross-listed as GLG 481. Prerequisite: CHM 341 or 441 or GLG 321.

NOTE: For the General Studies requirement, codes (such as L1, N3, C, and H), and courses, see pages 71–94. For graduation requirements, see pages 66–70. Omnibus courses are offered that are not listed in the catalog; see pages 44–45.

485 Meteorites and Cosmochemistry. (3) N
Chemistry of meteorites and their relationship to the origin of the earth, solar system, and universe. Cross-listed as GLG 485.

501 Current Topics in Chemistry. (1) F, S
May be repeated for credit. Prerequisite: instructor approval.

521 Computer Interfacing to Chemical Instrumentation. (3) N
Assembly and machine language programming of laboratory-size computers for data acquisition and online, real-time control of chemical instrumentation. Digital logic and timing considerations in hardware interfacing of computers. No prior knowledge of computers or electronics assumed. Sound knowledge of chemical instrumentation desirable. 2 hours lecture, 4 hours lab.

523 Advanced Analytical Chemistry. (3) A
Theoretical principles of analytical chemistry. Prerequisites: CHM 325 and 442 or equivalents.

525 Spectrochemical Methods of Analysis. (4) N
Theoretical and practical considerations involving the use of optical instruments for chemical analysis, emphasizing emission and absorption spectroscopy. 3 hours lecture, 3 hours lab. Prerequisite: CHM 442.

526 X-Ray Methods of Analysis. (4) N
Theoretical and practical considerations involving the use of X-ray diffraction and spectroscopy for chemical and structural analyses. 3 hours lecture, 3 hours lab. Prerequisite: CHM 442.

527 Electrical Methods of Chemical Analysis. (4) N
Theoretical and practical considerations of polarography, potentiometric, amperometric, and conductometric titrations. 2 hours lecture, 6 hours lab. Prerequisite: CHM 442.

531 Advanced Organic Chemistry I. (3) F
Reaction mechanisms, reaction kinetics, linear free energy relationships, transition state theory, molecular orbital theory, and Woodward-Hoffmann rules. Prerequisites: CHM 318 (or 332), 442.

532 Advanced Organic Chemistry II. (2) S
Continuation of CHM 531. Prerequisite: CHM 531.

537 Organic Reactions. (3) S
Important synthetic reactions of organic chemistry emphasizing recently discovered reactions of preparative value. Prerequisite: CHM 531.

541 Advanced Thermodynamics. (3) F
Equilibrium thermodynamics, chemical reactions, and phase equilibria. Introduction to statistical thermodynamics, critical phenomena, and kinetics. Prerequisite: CHM 442.

545 Quantum Chemistry I. (3) F
Basic quantum theory, chemical bonding, and molecular structure. Prerequisite: CHM 442.

546 Quantum Chemistry II. (3) S
Quantum theory of rate processes. Principles of spectroscopy and nonlinear optics. Prerequisite: CHM 545.

548 Chemical Kinetics. (2) N
Kinetic theory and rate processes. Prerequisite: CHM 545.

553 Advanced Inorganic Chemistry. (3) S
Principles of modern inorganic chemistry and their applications over the entire periodic system. Prerequisites: CHM 442 and 453 or equivalents.

556 Topics in Inorganic Chemistry. (3) N
May be repeated for credit. Prerequisites: CHM 553; instructor approval.

563 Biophysical Chemistry. (3) N
Physical chemistry of macromolecules, especially proteins, nucleic acids, and polysaccharides. Thermodynamics, hydrodynamics, and spectroscopy of and their relation to structure. Prerequisites: CHM 442, 462.

568 Molecular Mechanisms of Photosynthesis. (3) N
Structure and function of photosynthetic complexes; mechanism of energy conversion in plants, bacteria, and model systems. Cross-listed as BOT 568. Prerequisite: instructor approval.

579 Topics in Solid State Chemistry. (3) N
May be repeated for credit. Prerequisite: instructor approval.

582 Topics in Geochemistry and Cosmochemistry. (3) N
Topics of current interest for students in chemistry and other fields. Sampling of data and thought concerning phase equilibria, element distribution, meteorites, the Earth, and other planets. May be repeated for credit. Prerequisite: instructor approval.

583 Phase Equilibria and Geochemical Systems. (3) N
Natural reactions at high temperatures and pressures; silicate, sulfide, and oxide equilibria. Cross-listed as GLG 583.

Chicana and Chicano Studies Program

Edward J. Escobar
Director
(GHALL 204) 602/965-5091

PROFESSOR
ROMERO

ASSOCIATE PROFESSOR
ESCOBAR

The Chicana and Chicano Studies Program is an interdisciplinary degree program that examines the experiences, culture, artistic endeavors, and current status of people of Mexican descent living in the United States. The curriculum focuses on the practical application of Chicana and Chicano Studies for career development in selected professions and service to the community based on an understanding of the humanities, social sciences, and the arts.

CHICANA AND CHICANO STUDIES—B.A.

The major in Chicana and Chicano Studies requires 45 semester hours of course work. A minimum of 30 semester hours must be CCS, CSH, and CSS courses. The remaining course work

must be in a related field to be approved by an advisor. All Chicana and Chicano Studies majors must take 15 semester hours in the following core courses.

| | | |
|---|---|---|
| CCS 101 | Introduction to Chicana and Chicano Studies | 3 |
| CCS 111 | Introduction to Chicana and Chicano Culture..... | 3 |
| CCS 498 | Pro-Seminar..... | 3 |
| Two semester sequence in Chicana and Chicano history..... | | 6 |

Within the 45 semester hours Chicana and Chicano Studies majors also must take 18 semester hours in one of the following concentrations: language and culture, literature and the arts, or the social sciences. An additional 12 semester hours are divided evenly between each of the two concentrations outside the student's chosen concentration for a total of 45 semester hours. All Chicana and Chicano Studies majors must take an established minor or credential of at least 18 semester hours in another field.

CHICANA AND CHICANO STUDIES MINOR

The Chicana and Chicano Studies minor requires 18 semester hours of course work. All Chicana and Chicano Studies minors must take either CCS 101 Introduction to Chicana and Chicano Studies (3) or CCS 111 Introduction to Chicana and Chicano Culture (3) and HIS 430 20th-Century Chicano History (3). The student must also take at least three semester hours in each of the following Chicana and Chicano Studies concentrations: language and culture, literature and the arts, and the social sciences. Within the 18 semester hour requirement, students must take a minimum of 12 semester hours in CCS, CSH, and CSS courses. Any courses taken in a related field must be approved by an advisor.

CHICANA AND CHICANO STUDIES

CCS 101 Introduction to Chicana and Chicano Studies. (3) F

Historical and contemporary issues in the Chicana and Chicano community; focus on economic, sociological, cultural, and political status of Chicana and Chicanos in the U.S.

111 Introduction to Chicana and Chicano Culture. (3) S

Interdisciplinary analysis of customs, values, belief systems, and cultural symbols; special attention is given to cultural continuity and change.

300 Chicana and Chicano Culture and Society. (3) F

Intensive analysis of how Mexican American writers, artists, film makers, entertainers, and academicians have interpreted aspects of the Chicana and Chicano experience.

445 Teaching Chicana and Chicano Studies in Native Language. (3) A

Approaches/techniques for infusion of Chicana and Chicano Studies content into elementary and secondary bilingual curriculum. Taught in Spanish. Prerequisite: proficiency in Spanish.

446 Teaching Chicana and Chicano Studies in the Schools. (3) A

Approaches/techniques for infusion of Chicana and Chicano Studies content into elementary and secondary curriculum; designed for teachers who will work with Chicana and Chicano students.

498 Pro-seminar. (3) A

Required courses for majors on topic selected by instructor; writing intensive course related to the development of interdisciplinary research skills.

CHICANA AND CHICANO STUDIES

CSH 220 Chicana and Chicano Cultural Expression. (3) A

Interrelation between economic, social and political status and forms of artistic expression, i.e., music, dance, drama, literature, and graphic arts.

310 Chicana and Chicano Folklore. (3) A

Analysis of Chicana and Chicano folk beliefs, traditions, and practices.

350 Mexican and Mexican American Artistic Production. (3) A

Overview of Mexican and Mexican American artistic production from colonial times to present; emphasis on religious and folk art.

351 Contemporary Chicana and Chicano Art. (3) A

Intensive analysis of contemporary Chicana and Chicano art movement as appraised within the context of contemporary American art and the art of Mexico.

363 Chicana and Chicano Literature. (3) F

Development of Chicana and Chicano literature; study of genres and themes; attention to literary antecedents. Cross-listed as ENG 363.

485 Chicana Writers. (3) A

Critical reading of Mexican American women authors; emphasis on contemporary (post-1970) poetry, novels, short stories, and essays.

498 Pro-Seminar. (3) A

Required course for majors on topic selected by instructor; writing intensive course related to the development of interdisciplinary research skills.

CHICANA AND CHICANO STUDIES

CSS 315 Chicano Family Structures and Perceptions. (3) A

Traditional and changing family relationships; emphasis on gender and intergenerational relations and impact of modern society on traditional family values.

330 Chicana and Chicano Politics. (3) A

Historical/contemporary analysis of Chicana and Chicano political ideologies, attitudes, strategies, and movements; relations with governmental agencies; participation in political process.

331 Contemporary Issues in the Chicana and Chicano Community. (3) S

Historical, demographic, and sociological overview of the status of Chicanas and Chicanos in the U.S. and of salient issues affecting that community.

336 Issues in Immigration and Migration. (3) A

Historical/contemporary overview of Mexican immigration into and within the U.S.; factors affecting population movement, settlement patterns, and migrants' incorporation into society.

340 Chicanas and Chicanos in the U.S. Economy. (3) S

Historical/contemporary analysis of Chicanas' and Chicanos' relationship with the American economic system; emphasis on impact of changing American economy on Chicana and Chicano community.

432 Issues in Chicana and Chicano Gender. (3) A

Analysis of social construction of gender identities; emphasis on impact of American and Mexican cultural values on normative gender relations.

490 Field Studies in the Chicana and Chicano Community. (3) A

Introduction to principles and methods of qualitative research applied to the Chicana and Chicano community.

498 Pro-Seminar. (3) A

Required course for majors on topic selected by instructor; writing intensive course related to the development of interdisciplinary research skills.

Computer Science

A major in Computer Science is available in both the College of Liberal Arts and Sciences and the College of Engineering and Applied Sciences. Faculty and course descriptions appear on pages 297–302.

COMPUTER SCIENCE—B.S.

The program in Computer Science consists of 30 hours of core course work and 15 semester hours of senior-level breadth courses in the major. Also required are 18 semester hours of technical elective and mathematics courses approved by the department. The university requirement for literacy and critical inquiry is to be met in part by ECE 400 and ENG 301.

A minimum cumulative GPA of 2.50 is required to begin upper-division work in the major. A minimum grade of “C” is required in all CSE courses used for degree credit.

For more information, contact an advisor in the Office for Academic Programs, SS 111, or the Department of Computer Science and Engineering, GWC 206.

Economics

A B.A. or B.S. in Economics is offered in both the College of Liberal Arts and Sciences and the College of Business. Faculty, course descriptions, and the major requirements in the College of Business are listed on pages 235–237.

ECONOMICS—B.A. OR B.S.

The program in Economics consists of 45 semester hours of course work, 24 of which, at a minimum, must be in economics, and the remainder in closely related fields to be selected from the “Approved List of Related Field Courses” in consultation with the faculty advisor.

The following lower-division courses are required and must be counted as part of the 45-hour major:

| | | | |
|-------------|-----|--|----|
| ECN | 111 | Macroeconomic Principles <i>SB</i> | 3 |
| ECN | 112 | Microeconomic Principles <i>SB</i> | 3 |
| MAT | 210 | Brief Calculus <i>NI</i> | 3 |
| STP | 226 | Elements of Statistics <i>N2</i> | 3 |
| Total | | | 12 |

While MAT 210 meets the minimum mathematics requirement to major in Economics, all Economics majors who anticipate going on to graduate school in economics or in business or to law school are encouraged to take MAT 270 Calculus with Analytic Geometry I (4) offered in sections taught via the “reform” calculus method. The relevant section line numbers are available from the Department of Mathematics. Majors are encouraged to pursue further course work in mathematics. MAT 270 may be taken in lieu of MAT 210.

To qualify for upper-division course work in economics, the Economics major must earn a minimum grade of "C" in each of the previously listed courses, have junior class standing (56 semester hours), and have a minimum cumulative GPA of 2.50. ECN 313 Intermediate Macroeconomic Theory and ECN 314 Intermediate Microeconomic Theory are required and should be taken after the completion of the previously listed courses and before other upper-division courses in economics.

Credit earned by an Economics major in ECN 484 Economics Internship, whether as a legislative intern or through the Department of Economics Internship Program (and ECN 493 Honors Thesis), may not be used to satisfy the minimum 24 hours of economics course work requirement. However, up to six hours of ECN 484 and 493 may be used to meet the related fields requirement. See "Degree Requirements," page 107.

Latin American Studies Emphasis.

Students majoring in Economics may elect to pursue a Latin American Studies emphasis, combining courses from the major with selected outside courses of wholly Latin American content. See "Latin American Studies," page 111, for more information.

MINORS IN ECONOMICS

General Minor in Economics. The minor in Economics consists of 18 semester hours of credit which includes ECN 111 and ECN 112 plus any 12 hours of upper-division economics courses for which all prerequisites have been met.

Minors in Economics are encouraged to take calculus and statistics, which are prerequisites for ECN 313 Intermediate Macroeconomic Theory and ECN 314 Intermediate Microeconomic Theory so that these courses might be included in the minor. The College of Business does not permit its professional program students to enroll in this minor.

Minor in Economics for Students

Planning a Career in Law. One of the most dramatic recent developments in law is the integration of economic analysis in legal theory and decision making. Curricula at all major law schools reflect this change. Conse-

quently, future lawyers are being trained with courses that rely increasingly on microeconomic theory and econometrics.

The applications of economics to law have moved beyond the traditional areas of antitrust and regulation. First-year law courses now include microeconomic theory with applications to contracts, torts, criminal law, property, and constitutional law.

The minor in Economics for Students Planning a Career in Law provides an opportunity for prospective law students to take courses that provide them with analytical tools essential for the study of law. The pre-law minor consists of a minimum of 18 semester hours. The College of Business does not permit its professional program students to enroll in this minor.

Required courses are as follows:

| | | |
|---------|--|---|
| ECN 111 | Macroeconomic Principles <i>SB</i> | 3 |
| ECN 112 | Microeconomic Principles <i>SB</i> | 3 |
| ECN 314 | Intermediate Microeconomics Theory <i>SB</i> | 3 |
| ECN 450 | Law and Economics <i>L2</i> | 3 |
| ECN 480 | Introduction to Econometrics <i>N2</i> | 3 |

Also required is at least one additional course from the following:

| | | |
|---------|-------------------------------------|---|
| ACC 316 | Managerial Uses of Accounting | 3 |
| ECN 421 | Labor Economics <i>SB</i> | 3 |
| ECN 453 | Government and Business | 3 |
| ECN 494 | Public Choice | 3 |
| FIN 361 | Managerial Finance | 3 |

SECONDARY EDUCATION— B.A.E.

The minor teaching field consists of 21 semester hours. ECN 111 Macroeconomic Principles and ECN 112 Microeconomic Principles and MAT 210 Brief Calculus are required. The remainder must be approved by the advisor in consultation with the student.

Social Studies. See page 188.

GRADUATE PROGRAMS

The Department of Economics offers programs leading to the M.S. and Ph.D. degrees. Consult the *Graduate Catalog* for requirements.

Faculty and course descriptions are listed on pages 235–237.

Department of English

Nancy A. Gutierrez
Chair
(LL B504) 602/965–3168

REGENTS' PROFESSORS

N. DUBIE, RIOS

PROFESSORS

BENDER, BJORK, BOYER, BRACK, D. BRINK, J. BRINK, BUCKINGHAM, CANDELARIA, CARLSON, DONELSON, EVANS, M. HARRIS, HELMS, KEHL, LIGHTFOOT, NEY, A. NILSEN, D. NILSEN, RHODES, ROEN, SANDS, SHINN

ASSOCIATE PROFESSORS

ADAMS, BATES, J. GREEN, GUTIERREZ, HORAN, JANSSEN, JOHNSON, MAHONEY, MAJOR, MILLER, MORGAN, OJALA, RAMAGE, SCHWALM, SENSIBAR, VANDEN HEUVEL, WILKINS

ASSISTANT PROFESSORS

CASTLE, COLBY, DALYGOGGIN, J. DUBIE, GOLDBERG, K. HARRIS, LUSSIER, McCABE, NELSON, PERRY, PRITCHARD, STEVENS, VAN GELDEREN

LECTURERS

COOK, DUGAN, DWYER, OBERMEIER, WHEELER

ACADEMIC PROFESSIONAL

GLAU

PROFESSORS EMERITI

BROSE, D'ANGELO, DOEBLER, ERNO, FISHER, M. GREEN, HABERMAN, HAKAC, HERMAN, MURRAY, NEBEKER, POWERS, RANDALL, SALERNO, SHAFER, TURNER

ENGLISH—B.A.

The B.A. in English consists of 45 semester hours in English. Required courses are as follows:

| | | |
|--------------|--|---|
| ENG 200 | Critical Reading and Writing about Literature <i>LI/HU</i> | 3 |
| ENG 221, 222 | Survey of English Literature <i>HU, H</i> | 6 |
| ENG 312 | English in Its Social Setting <i>HU</i> | 3 |
| | or ENG 314 Modern Grammar (3) | |
| | or ENG 413 History of the English Language <i>HU</i> (3) | |

| | |
|--|---|
| ENG 341, 342 American Literature <i>HU</i> | 6 |
| ENG 421 Shakespeare <i>HU</i> | 3 |

Also required are an upper-division course in English literature before 1660, an upper-division course in English literature between 1660 and 1900, an upper-division course in 20th-century British or American literature, and an upper-division course in women's literature or American ethnic literature. Twelve additional hours are free electives chosen from the department's offerings at the 200 level or above. A grade of "C" or better is required in all courses taken for the major. *No course may be used to satisfy more than one requirement.* At least 18 hours must be in upper-division courses.

MINOR IN ENGLISH

The English minor consists of 24 hours in English. Required courses are as follows:

| | |
|--|---|
| ENG 200 Critical Reading and Writing about Literature <i>L1/HU</i> | 3 |
| ENG 221 Survey of English Literature <i>HU, H</i> | 3 |
| or ENG 222 Survey of English Literature <i>HU, H</i> (3) | |
| ENG 312 English in Its Social Setting <i>HU</i> | 3 |
| or ENG 314 Modern Grammar (3) | |
| or ENG 413 History of the English Language <i>HU</i> (3) | |
| ENG 341 American Literature <i>HU</i> | 3 |
| or ENG 342 American Literature <i>HU</i> (3) | |
| ENG 421 Shakespeare <i>HU</i> | 3 |

Also required is one upper-division course in English or American literature. Six additional hours are free electives chosen from the department's offerings at the 200 level or above. A grade of "C" or better is required in all courses taken for the minor.

SECONDARY EDUCATION— B.A.E.

English. The major teaching field consists of 42 semester hours in English. Required courses are as follows:

| | |
|--|---|
| ENG 200 Critical Reading and Writing about Literature <i>L1/HU</i> | 3 |
|--|---|

| | |
|--|---|
| ENG 212 English Prose Style <i>L1</i> | 3 |
| or ENG 215 Strategies of Academic Writing <i>L1</i> (3) | |
| or ENG 216 Persuasive Writing on Public Issues <i>L1</i> (3) | |
| or ENG 217 Personal and Exploratory Writing <i>L1</i> (3) | |
| ENG 221, 222 Survey of English Literature <i>HU, H</i> | 6 |
| ENG 312 English in Its Social Setting <i>HU</i> | 3 |
| or ENG 314 Modern Grammar (3) | |
| ENG 341, 342 American Literature <i>HU</i> | 6 |
| ENG 421 Shakespeare <i>HU</i> | 3 |
| ENG 471 Literature for Adolescents <i>HU</i> | 3 |
| ENG 480 Methods of Teaching English..... | 3 |

Also required is one course in women's literature or American ethnic literature. Nine additional hours are free electives chosen from English department offerings, six hours of which must be in the upper division. ENG 471 and 480 must be taken before student teaching.

The minor teaching field consists of 24 semester hours. Required courses are as follows:

| | |
|--|---|
| ENG 200 Critical Reading and Writing about Literature <i>L1/HU</i> | 3 |
| ENG 212 English Prose Style <i>L1</i> | 3 |
| or ENG 215 Strategies of Academic Writing <i>L1</i> (3) | |
| or ENG 216 Persuasive Writing on Public Issues <i>L1</i> (3) | |
| or ENG 217 Personal and Exploratory Writing <i>L1</i> (3) | |
| ENG 221 Survey of English Literature <i>HU, H</i> | 3 |
| or ENG 222 Survey of English Literature <i>HU, H</i> (3) | |
| ENG 312 English in Its Social Setting <i>HU</i> | 3 |
| or ENG 314 Modern Grammar (3) | |
| ENG 341 American Literature <i>HU</i> | 3 |
| or ENG 342 American Literature <i>HU</i> (3) | |
| ENG 471 Literature for Adolescents <i>HU</i> | 3 |
| ENG 480 Methods of Teaching English..... | 3 |

Also required is an additional upper-division elective in English.

These courses are also recommended for Elementary Education majors.

GRADUATE PROGRAMS

The Department of English offers programs leading to the Master of Arts degree in English (with concentrations in comparative literature, English linguistics, literature and language, and rhetoric and composition), Master of Fine Arts degree in Creative Writing (fiction, nonfiction, poetry, and screenwriting), Master of Teaching English as a Second Language degree, and Doctor of Philosophy degree in English (with numerous emphases). Consult the *Graduate Catalog* for requirements.

ENGLISH

ENG 101 First-Year Composition. (3) F, S, SS

Discovering, organizing, and developing ideas in relation to the writer's purpose, subject, and audience. Emphasis on modes of written discourse and effective use of rhetorical principles. Foreign students, see ENG 107. Prerequisite: see pages 56 and 154.

102 First-Year Composition. (3) F, S, SS Critical reading and writing; emphasis on strategies of academic discourse. Research paper required. Foreign students, see ENG 108. Prerequisite: ENG 101 with grade of "C" or better.

105 Advanced First-Year Composition. (3) F, S

A concentrated composition course for students with superior writing skills; intensive reading; research papers; logical and rhetorical effectiveness. Not open to students with credit in First-Year Composition. Prerequisite: see pages 56 and 154.

107 English for Foreign Students. (3) F, S For students from non-English speaking countries who have studied English in their native countries, but who require practice in the idioms of English. Intensive reading, writing, and discussion. Satisfies the graduation requirement of ENG 101.

108 English for Foreign Students. (3) F, S For foreign students; critical reading and writing; strategies of academic discourse. Research paper required. Satisfies graduation requirement of ENG 102. Prerequisite: ENG 107 with grade of "C" or better.

114 English Grammar and Usage. (3) F, S The fundamentals of English grammar (word and phrase structure) and of English usage (punctuation, grammatical correctness).

Completion of the First-Year Composition requirement is a prerequisite for all English courses above the 100 level.

200 Critical Reading and Writing about Literature. (3) F, S

Introduction to the terminology, methods, and objectives of the study of literature, with practice in interpretation and evaluation. For English majors and minors only. *General Studies: L1/HU.*

201 World Literature. (3) F

The classical and medieval periods. Selections from the great literature of the world in translation and lectures on the cultural background. *General Studies: HU, H.*

202 World Literature. (3) S

The Renaissance and modern periods. Selections from the great literature of the world in translation and lectures on the cultural background. *General Studies: HU, H.*

204 Introduction to Contemporary Literature. (3) F, S

Poetry, fiction, drama, and possibly other genres. *General Studies: HU.*

210 Introduction to Creative Writing. (3) F, S

Beginning writing of poetry, fiction, and drama (both stage and screen). Separate sections for each genre. Each genre may be taken once.

212 English Prose Style. (3) N

Analysis and practice of writing in various classical and modern prose styles. Prerequisites: grade of "B" in ENG 102 and English major or approval of advisor and instructor. *General Studies: L1.*

213 Introduction to the Study of Language. (3) F, S

Language as code; phonetics, phonology, morphology, and syntax; the lexicon; language acquisition; sociolinguistics.

215 Strategies of Academic Writing. (3) F, S

Advanced course in techniques of analyzing and writing academic expository prose. Writing is research based. *General Studies: L1.*

216 Persuasive Writing on Public Issues. (3) F, S

Advanced course in techniques of analyzing and writing persuasive arguments addressing topics of current public interest. Papers are research based. *General Studies: L1.*

217 Personal and Exploratory Writing. (3) F, S

Using writing to explore one's self and the world one lives in; emphasis on expository writing as a means of learning. *General Studies: L1.*

218 Writing about Literature. (3) F, S

Advanced writing course requiring analytical and expository essays about fiction, poetry, and drama. For non-English majors. *General Studies: L1.*

221 Survey of English Literature. (3) F, S

Medieval, Renaissance, and 18th-century literature. Emphasis on major writers and their works in their literary and historical contexts. *General Studies: HU, H.*

222 Survey of English Literature. (3) F, S

Romantic, Victorian, and 20th-century literature. Emphasis on major writers and their works in their literary and historical contexts. *General Studies: HU, H.*

260 Film Analysis. (3) N

Understanding and enjoyment of film and its correlation to literature, art, music, and other disciplines. *General Studies: HU.*

A term paper or equivalent out-of-class written work is required in all upper-division (300–400-level) ENG courses.

301 Writing for the Professions. (3) F, S

Advanced practice in writing and editing expository prose. Primarily for preprofessional majors. *General Studies: L1.*

303 Classical Backgrounds of English Literature. (3) N

Selected readings of Greek and Latin literature in translation, emphasizing forms, ideas, and myths, as they relate to literature in English. *General Studies: HU.*

307 Utopian Literature. (3) N

Selected works from the present to the classical period, including *Walden Two*, *Walden*, *Utopia*, and *The Republic*. *General Studies: HU.*

310 Intermediate Creative Writing. (3) F, S

Separate sections for fiction and poetry. May be taken once for poetry, once for fiction. Lectures, writing assignments, discussion, criticism. Prerequisite: ENG 210 or instructor approval.

312 English in Its Social Setting. (3) F, S

Introduction to the sociolinguistic study of the English language. *General Studies: HU.*

314 Modern Grammar. (3) F, S

Modern descriptive models of English grammar.

321 Introduction to Shakespeare. (3) F, S

Shakespeare's major comedies, histories, and tragedies. *General Studies: L2/HU.*

331 American Drama. (3) A

Major works in the development of American drama from its beginnings to the present. *General Studies: L2.*

332 Major American Novels. (3) A

Novels from the 19th century to the present studied in their historical and cultural contexts. *General Studies: L2.*

333 American Ethnic Literature. (3) A

Examination of America's multiethnic identity through works of literature that depict American ethnic, gender, and class sensibilities. *General Studies: L2, C.*

341 American Literature. (3) F, S

From colonial times to the Civil War, including the growth of nationalism and romanticism. *General Studies: HU.*

342 American Literature. (3) F, S

From the Civil War to the present. Development of realism, naturalism and modernism, and contemporary trends in prose and poetry. *General Studies: HU.*

345 Selected Authors or Issues. (3–4) N

Different topics may be offered. Film topics with lab may carry 4 credits. Repeat credit for different topics.

352 Short Story. (3) F, S

Development of the short story as a literary form; analysis of its technique from the work of representative authors. *General Studies: HU.*

353 African-American Literature: Beginnings through the Harlem Renaissance. (3) F

Thematic and cultural study of African-American literature through the Harlem Renaissance. *General Studies: L2/HU, C.*

354 African-American Literature: Post-Harlem Renaissance to the Present. (3) S

Thematic and cultural study of African-American literature since the Harlem Renaissance. *General Studies: L2/HU, C.*

355 History of the Drama. (3) S

Development of European drama from the Greek to the Romantic Period. *General Studies: L2/HU.*

356 Biblical Backgrounds of Literature. (3) F, S

Readings in Old and New Testaments, emphasizing ideas, literary types, and sources as they appear in literature. *General Studies: HU.*

357 Introduction to Folklore. (3) N

Survey of the history, genres, and dynamics of folklore, with emphasis on oral traditions. *General Studies: HU.*

359 American Indian Literatures. (3) S

Selected oral traditions of American Indians and their influences on contemporary Native American literary works. *General Studies: L2/HU, C.*

360 History of Film. (4) N

Emphasis on American film, with some study of European film. 3 hours lecture, 4 hours of screening. *General Studies: HU.*

361 Silent Film. (4) F

Development of motion pictures from 1850 through 1930. 3 hours lecture, screenings. *General Studies: HU.*

362 Sound Film Genres. (4) S

Examination of the Western, the horror film, the comedy, and other genres. 3 hours lecture, screenings. *General Studies: HU.*

363 Chicano Literature. (3) F

Development of Chicano literature; study of genres and themes; attention to literary antecedents. Cross-listed as CSH 363. *General Studies: C.*

English majors and minors are expected to have completed ENG 200 before taking 400-level literature courses.

400 History of Literary Criticism. (3) S

Major critics and critical traditions in the western world. Prerequisite: 6 hours of literature or instructor approval. *General Studies: HU.*

405 Style and Stylistics. (3) N

Linguistic, rhetorical, and literary approaches to the analysis of style in poetry, fiction, and other forms of written discourse.

408 Advanced Screenwriting I. (3) F

A study of the principles of dramaturgy or dramatic structure, with particular emphasis on character as the creator of events.

409 Advanced Screenwriting II. (3) S

Application of the principles taught in a complete feature-length screenplay. Prerequisite: ENG 408.

411 Advanced Creative Writing. (3) F, S

Separate poetry and fiction workshops for experienced writers, emphasizing individual style. May be taken once for poetry, once for fiction. Prerequisite: ENG 310 or instructor approval.

412 Professional Writing. (3) N

Lectures and conferences concerning techniques of writing for publication. Prerequisite: ENG 310 or instructor approval.

413 History of the English Language. (3) F, S

Development of English from the earliest times to the modern period. Prerequisite: junior standing or instructor approval. *General Studies: HU.*

415 Medieval Literature. (3) F

Medieval English literature in translation, from *Beowulf* to Malory (excluding Chaucer), emphasizing cultural and intellectual backgrounds; includes continental works. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

- 416 Chaucer: *Canterbury Tales*.** (3) F
Chaucer's language, his last work, and its relationship to continental and insular traditions. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*
- 417 Chaucer: *Troilus and Criseyde* and the *Minor Works*.** (3) S
Chaucer's language, his major poem, and his early works in their medieval context. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*
- 418 Renaissance Literature.** (3) F
Poetry and prose, 1485–1603, excluding the drama. Humanism and major genres; More, Sidney, Spenser, and other representative writers. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*
- 419 English Literature in the Early 17th Century.** (3) S
Prose and poetry, exclusive of Milton and the drama. Metaphysical, Cavalier, and neoclassical verse; Donne, Jonson, Bacon, and other representative writers. Prerequisite: ENG 221 or instructor approval. *General Studies: L2/HU.*
- 421 Shakespeare.** (3) F, S
A selection of comedies, histories, and tragedies. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*
- 422 Studies in Shakespeare.** (3) F, S
Topics for close examination in selected dramatic and/or nondramatic works. May be repeated for credit when topics vary. Prerequisite: ENG 421 or instructor approval. *General Studies: HU.*
- 423 Renaissance Drama.** (3) S
Drama of the Tudor and early Stuart periods (exclusive of Shakespeare). Includes Kyd, Marlowe, Jonson, and Webster. Prerequisite: ENG 221 or instructor approval. *General Studies: L2/HU.*
- 424 Milton.** (3) F, S
Selected prose and poetry, emphasizing *Paradise Lost*, *Paradise Regained*, and *Samson Agonistes*. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*
- 425 Romantic Poetry.** (3) F
Poetry of Wordsworth, Coleridge, Shelley, Keats, and Byron. *General Studies: HU.*
- 426 Victorian Poetry.** (3) F
Poetry of the second half of the 19th century. Special study of Tennyson, Browning, and Arnold. Prerequisite: ENG 222 or instructor approval. *General Studies: L2/HU.*
- 427 Restoration and Early 18th Century.** (3) F
Writers and movements in the nondramatic literature of the Restoration and early 18th century. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*
- 428 The Later 18th Century.** (3) S
Writers, movements, and books during the second half of the 18th century. Prerequisite: ENG 221 or instructor approval. *General Studies: L2/HU.*
- 430 Victorian Cultural Backgrounds.** (3) N
Social, religious, and other cultural issues in prose by such writers as Carlyle, Ruskin, Darwin, Arnold, Pater, and Morris. Prerequisite: ENG 222 or instructor approval. *General Studies: L2/HU.*
- 435 19th-Century American Poetry.** (3) S
Themes and developments in American poetry to 1900, including Poe, Whitman, and Dickinson. *General Studies: HU.*
- 439 Restoration and 18th-Century Drama.** (3) S '97
English drama 1600–1800. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*
- 440 American Literature to 1815.** (3) N
Thought and expression from the time of the first English-speaking colonies to 1815. Prerequisite: ENG 341 or instructor approval. *General Studies: HU.*
- 441 20th-Century American Drama.** (3) N
American drama since World War I, especially experimental techniques. Prerequisite: ENG 341 or 342 or instructor approval. *General Studies: HU.*
- 442 20th-Century British and Irish Poetry.** (3) F
Theory and practice of poetry since 1900. Prerequisite: ENG 222 or instructor approval.
- 443 American Poetry, 1900–1945.** (3) F
Developments in theory and practice of major poets. Prerequisite: ENG 341 or 342 or instructor approval. *General Studies: HU.*
- 444 Studies in American Romanticism, 1830–1860.** (3) F
Cultural expression in works of representative writers. Prerequisite: ENG 341 or instructor approval. *General Studies: HU.*
- 445 American Realism, 1870–1900.** (3) S
Writers and influences that shaped the development of literary realism. *General Studies: L2/HU.*
- 448 20th-Century British and Irish Novel.** (3) S
Theory and practice of the novel since 1900. Prerequisite: ENG 222 or instructor approval. *General Studies: HU.*
- 451 The Novel to Jane Austen.** (3) F
From origins of prose fiction through the 18th century. *General Studies: HU, H.*
- 452 The 19th-Century Novel.** (3) S
From Scott to Conrad. *General Studies: HU.*
- 453 The American Novel to 1900.** (3) F
The rise and development of the novel to Dreiser. Prerequisite: ENG 341 or instructor approval. *General Studies: HU.*
- 454 The American Novel, 1900–1945.** (3) F
Developments in theory and practice of major novelists. Prerequisite: ENG 341 or 342 or instructor approval. *General Studies: HU.*
- 455 The Form of Verse: Theory and Practice.** (3) N
Types, history, criticism, and schools of theory of metrical form. Analysis of lyric, narrative, and dramatic poetry.
- 457 American Poetry Since 1945.** (3) S
Major American poets of the period. Developments in theory and practice. Prerequisite: ENG 341 or instructor approval. *General Studies: HU.*
- 458 American Novel Since 1945.** (3) S
Major novelists of the period. Developments in theory and practice. Prerequisite: ENG 342 or instructor approval. *General Studies: L2/HU.*
- 460 Western American Literature.** (3) S
Critical examination of ideas and traditions of the literature of the western United States, including the novel. *General Studies: HU.*
- 461 Women and Literature.** (3) N
Selected topics in literature by or about women. May be repeated for credit when topics vary. *General Studies: HU.*
- 462 20th-Century Women Authors.** (3) F
Critical examination of literature by 20th-century women writers. May be repeated for credit when topics vary. *General Studies: HU.*
- 463 European Drama from Ibsen to 1914.** (3) N
Chief continental and British dramatists of the period, emphasizing the beginnings and development of realism. *General Studies: HU.*
- 464 European Drama from 1914 to the Present.** (3) N
Chief continental and British dramatists of the period, emphasizing experimental techniques. *General Studies: HU.*
- 471 Literature for Adolescents.** (3) F, S
Prose and poetry that meet the interests and capabilities of junior high and high school students. Recent literature stressed. A passing grade of at least "C" required before students are permitted to student teach in English. *General Studies: HU.*
- 480 Methods of Teaching English.** (3) F, S
Methods of instruction, organization, and presentation of appropriate content in English. A passing grade of at least "C" required before students are permitted to student teach in English. Prerequisite: ENG 312 or 314 or 413.
- 500 Research Methods.** (3) F
Methodology and resource materials for research. Analysis of criticism and scholarship, including evaluation of sources.
- 501 Introduction to Comparative Literature.** (3) N
Problems, methods, and principles, illustrated by selected critical essays and literary texts.
- 502 Contemporary Critical Theory.** (3) F
An advanced survey of major schools of 20th-century literary and critical theory. Lecture, discussion. Cross-listed as HUM 549.
- 507 Old English.** (3) F
Elements of Old English grammar with selected readings.
- 508 Old English Literature.** (3) N
Intensive literary, linguistic, and cultural study of Old English literature. May be repeated for credit when topics vary. Prerequisite: ENG 507.
- 509 Middle English.** (3) S
A study of the principal dialects of the language with selected readings. Prerequisite: graduate standing.
- 512 The Teaching of Composition.** (3) N
The theory and practice of teaching writing at all levels. Emphasis on current research. Prerequisites: teaching experience; instructor approval.
- 515 Middle English Literature.** (3) N
English literature from the 12th through the 15th centuries, exclusive of Chaucer. Prerequisite: ENG 509 or instructor approval.

517 Contemporary Rhetorical Theory. (3) F
Investigation of the work of such important rhetorical theorists as Burke, Toulmin, Perelman, Gates, and Cixous. Seminar.

520 Renaissance Literature. (3) S
Poetry and prose of the English Renaissance, excluding drama.

521 Shakespeare. (3) F, S
A selection of comedies, histories, and tragedies presented in the context of literary history and critical theories, with an emphasis on classical and medieval backgrounds.

525 American Literary Criticism. (3) N
Analysis and discussion of leading historical and critical interpretations of American literature from the beginnings to the present.

530 Classical Rhetoric and Written Composition. (3) F '97
Relationship of major texts in classical rhetoric to developments in composition theory, literary theory, and practice through the 19th century.

531 Rhetorical Theory and Literary Criticism. (3) S '97
Intensive study of major rhetorical theorists of the 20th century in such areas as literary criticism, discourse theory, and composition theory.

532 Composition Theory. (3) N
Intensive study in the rhetorical categories of invention, arrangement, style, aims, modes, and forms of written discourse.

545 Studies in English Literature. (3) N
This course offers selected authors or issues and may be repeated for credit.

547 Studies in American Literature. (3) N
This course offers selected authors or issues and may be repeated for credit.

549 Studies in Comparative Literature. (3) N
This course offers selected authors or issues and may be repeated for credit.

550 Contemporary Comparative Literature. (3) F
Comparative studies in modern literature in English and other literatures in translation. May be repeated for credit when content varies.

560 Studies in Dramatic Forms. (3) F, S
Selected topics in dramatic and cinematic literature, history, criticism, theory, and cross-disciplinary study. May be repeated for credit when topic varies. Lecture, studio.

571 Advanced Study in Literature for Adolescents. (3) N
History and criticism of adolescent literature. Prerequisite: ENG 471 or instructor approval.

573 Censorship and Literature. (3) N
The history of censorship, primarily in the United States, and significant court decisions that affected writers and books.

591 Seminar. (3) F, S
Selected topics regularly offered in the various areas of English studies.

LINGUISTICS

LIN 500 Research Methods. (3) F
Methodology and resource materials for research. Analysis of criticism and scholarship, including evaluation of sources.

505 American English. (3) F
Development of the English language in America, including a survey of geographical and social dialects.

510 English Linguistics. (3) F
Current approaches to the study of the English language.

511 Phonetics and Phonology. (3) S
Current trends in phonological theory and its basis in acoustic and articulatory phonetics. Prerequisite: LIN 510 or equivalent or instructor approval.

513 Semantics. (3) F '96
Current approaches to linguistic meaning with particular attention to English. Prerequisite: LIN 510 or equivalent or instructor approval.

514 Syntax. (3) S
The analysis of syntactic structure by contemporary theoretical models with a focus on English. Prerequisite: LIN 510 or equivalent or instructor approval.

516 Pragmatics and Discourse Theory. (3) F '97
The study of language use in context and of language structures in conversation and written text. Lecture, discussion. Prerequisite: LIN 510 or equivalent or instructor approval.

548 Studies in English Language. (3) N
This course offers selected authors or issues and may be repeated for credit.

572 Theories Underlying the Acquisition of English as a Second Language. (3) F
Theories of second language acquisition including the linguistic, cognitive, affective, and sociocultural aspects.

574 The Teaching of English as a Second Language. (3) S
Methods of teaching English as a second language, language teaching trends, practical applications, and the teaching of different skills. Prerequisite: LIN 572 or instructor approval.

575 Advanced Studies in the Teaching of English as a Second Language. (3) F
Current research issues in the teaching and learning of English as a second language. Prerequisite: LIN 572 or instructor approval.

576 Sociolinguistic Aspects of Second Language Acquisition. (3) N
A survey of studies in second language acquisition in the context of recent sociolinguistic theory.

577 Grammar for TESL. (3) N
A survey of major grammatical structures in English and how they can be taught to ESL speakers. Lecture, discussion. Prerequisite: LIN 510.

591 Seminar. (3) F, S
Selected topics.

593 Applied Project. (3) F, S
Preparation of a supervised applied project that is a graduation requirement in the TESL professional major. Independent study with consultation.

Omnibus Courses: See pages 44–45 for omnibus courses that may be offered.

WRITING ACROSS THE CURRICULUM

WAC 101 Introduction to Academic Writing. (3) F, S
Combines classroom and supplemental instruction to teach academic genres of writing including definition, summary, and analysis.

Department of Exercise Science and Physical Education

William J. Stone
Chair
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REGENTS' PROFESSOR D.M. LANDERS

PROFESSORS

BURKETT, CORBIN, CORDER,
DARST, KRAHENBUHL,
OSTERHOUDT, PANGRAZI,
STELMACH, STOCK, STONE,
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K. THOMAS, WILLIS

SENIOR LECTURER

D. LANDERS

PROFESSORS EMERITI

BRYANT, DEACH, GRIER, KAJIKAWA,
KLANN, MAARSINGH, McFARLAND,
ODENKIRK, PACKER, PITTMAN,
RICHARDSON, STEVERSON,
STEWART, THOMSON,
WEGNER, WULK

EXERCISE SCIENCE/PHYSICAL EDUCATION—B.S.

The B.S. in Exercise Science/Physical Education consists of 45 semester hours, including 21 semester hours of required EPE core courses. The remaining 24 semester hours of EPE and other courses are prescribed by the specific concentration the student selects. The required EPE core courses are as follows:

| | | | |
|-----|-----|--|---|
| EPE | 110 | Movement Analysis Laboratory | 6 |
| EPE | 335 | Biomechanics | 3 |
| EPE | 340 | Physiology of Exercise..... | 3 |
| EPE | 345 | Motor and Developmental Learning | 3 |
| EPE | 352 | Psychosocial Aspects of Physical Activity | 3 |
| EPE | 450 | History and Philosophy of Sport..... | 3 |

Each EPE core course has specific prerequisite courses that must be taken before taking the respective core course. These prerequisite courses include the following:

| | | |
|---------|---|---|
| CHM 101 | Introductory Chemistry <i>SI/S2</i> | 4 |
| HIS 102 | Western Civilization <i>SB, G/H</i> | 3 |
| | or PHI 101 Introduction to Philosophy <i>HU</i> (3) | |
| MAT 117 | College Algebra <i>NI</i> | 3 |
| PGS 101 | Introduction to Psychology <i>SB</i> | 3 |
| ZOL 201 | Human Anatomy and Physiology I <i>S2</i> | 4 |
| ZOL 202 | Human Anatomy and Physiology II | 4 |

All prerequisite and EPE courses must be completed with a minimum grade of “C.” The requirements for the specific concentrations are described below.

Majors must elect either the exercise and sport studies or the exercise and wellness concentration.

Exercise and Sport Studies Concentration. Candidates for the exercise and sport studies concentration must complete 24 semester hours beyond the core courses in the major field, at least 12 of which must carry EPE prefixes, be upper-division courses, and concern the theoretical subjects of the core. The remaining 12 semester hours may carry either EPE prefixes or prefixes from related disciplines selected with the advice and consent of a faculty advisor. Activity courses may not be used to fulfill part of the 24-semester-hour requirement. No more than six semester hours may be in independent study courses.

Exercise and Wellness Concentration. Candidates for the exercise and wellness concentration must complete 24 semester hours beyond the required EPE core courses:

| | | |
|---------|--|---|
| EPE 300 | Foundations of Exercise and Wellness | 3 |
| EPE 320 | Fitness and Wellness Management | 3 |
| EPE 420 | Exercise Testing | 3 |
| EPE 425 | Exercise Prescription..... | 3 |
| EPE 484 | Internship..... | 6 |

Nine semester hours must be selected from an approved list of concentration electives that includes EPE courses and courses from nutrition, computer science/statistics, and business.

EXERCISE SCIENCE/PHYSICAL EDUCATION MINOR

The minor in Exercise Science/Physical Education consists of the core sequence in exercise science and physical education as follows, plus all prerequisite courses:

| | | |
|---------|---|---|
| EPE 110 | Movement Analysis Laboratory | 6 |
| EPE 335 | Biomechanics | 3 |
| EPE 340 | Physiology of Exercise..... | 3 |
| EPE 345 | Motor and Developmental Learning | 3 |
| EPE 352 | Psychosocial Aspects of Physical Activity | 3 |
| EPE 450 | History and Philosophy of Sport..... | 3 |

SECONDARY EDUCATION—B.A.E.

Physical Education. Candidates for the B.A.E. are required to complete 19 semester hours in physical education beyond the required EPE core courses:

| | | |
|---------|--|-----|
| EPE 110 | Movement Analysis Laboratory | 1–2 |
| EPE 361 | Physical Education in the Secondary School | 3 |
| EPE 376 | Physical Education for the Elementary School | 3 |
| EPE 382 | Physical Education for the Atypical Student | 3 |
| EPE 480 | Methods of Teaching Physical Education | 3 |
| EPE 483 | Evaluation in Physical Education..... | 3 |

Students must also complete a four-semester professional sequence in the College of Education (32 semester hours). Entry into this degree program requires filing an application, passing scores on a Pre-Professional Skills Test (PPST) or American College Test (ACT), 56 semester hours of completed university study, and a minimum GPA of 2.50. See the “College of Education” section for additional requirements.

GRADUATE PROGRAMS

The Department of Exercise Science and Physical Education offers a program leading to the Master of Science degree in Exercise Science/Physical Education. The department also participates with the Graduate College in the program leading to the Doctor of

Philosophy degree in Exercise Science and with the College of Education and the Graduate College in the program leading to the Doctor of Philosophy degree in Curriculum and Instruction with concentrations in exercise and wellness education and in physical education. Consult the *Graduate Catalog* for requirements.

HEALTH SCIENCE

HES 100 Introduction to Health and Wellness. (3) F, S, SS
Current concepts of health and wellness. Cross-listed as EPE 100.

305 Substance Abuse. (3) F
General properties, principles of action, and behavioral effects of psychoactive drugs. Focuses on how substances affect health of humans.

382 Introduction to Public Health. (3) N
Public and community health is examined, including governmental, voluntary, and community agency activities that promote health among populations.

505 Drug Dependency: Perspectives and Approaches. (3) S
Classification of mood-modifying substances in terms of effects. Motivational and social forces contributing to the dynamics of the problem; control and treatment.

Students who satisfactorily complete selected HES 494 courses are eligible to qualify for a certificate of accomplishment from the Centers for Disease Control, U.S. Department of Health and Human Services.

EXERCISE SCIENCE/PHYSICAL EDUCATION

A \$5.00 towel and locker fee is required each semester by students using towel and locker facilities for physical education classes and intramural activities.

Physical education activity classes (EPE 105, 205, 305, 310) may not be taken for audit. Excessive absences and/or tardiness are considered disruptive behavior.

EPE 100 Introduction to Health and Wellness. (3) F, S, SS
Current concepts of health and wellness. Cross-listed as HES 100.

105 Physical Education Activity. (1) F, S, SS

Beginning instruction in a wide variety of sports such as aerobics, aquatics, racquet sports, physical conditioning, and golf. 3 hours a week. “Y” grade only. May be repeated.

110 Movement Analysis Laboratory. (1–2) F, S, SS

Practical application of biomechanical, physiological, psychological, and learning principles in the analysis of skill acquisition and performance. Prerequisites: EPE 105 proficiency; ESPE major.

205 Physical Education Activity. (1) F, S, SS

Intermediate levels. Continuation of EPE 105. 3 hours a week. May be repeated for credit.

283 Prevention and Care of Athletic Injuries. (3) F

Taping, injury recognition, emergency care, and observation procedures in athletic training. Prerequisites: ZOL 201, 202.

290 Sports Officiating. (3) F

Rules and mechanics of officiating used in football, basketball, and volleyball.

291 Theory of Coaching. (3) F, S

Theory of coaching competitive sports. Prerequisite: ESPE major.

292 Sports Officiating. (3) S

Rules and mechanics of officiating used in softball (slow and fast pitch), baseball, and track and field.

300 Foundations of Exercise and Wellness. (3) F

Analysis of research in various disciplines which contribute to health promotion and wellness.

301 Fitness for Living. (1) F, S

Application of principles of physical activity to personal fitness testing and program planning for people of all ages. Telecampus course. Not open to students who have credit for EPE 325.

305 Physical Education Activity. (1) F, S, SS

Advanced levels. Continuation of EPE 205, with instructor's approval. 3 hours a week. May be repeated.

310 Collegiate Sports. (1) F, S

Participation in men's or women's intercollegiate competition. May be repeated for 4 credits, 1 per year. "Y/E" grade.

320 Program Development and Leadership. (3) S

Principles of planning, organizing, promoting, and leading fitness and wellness programs. For majors only.

325 Fitness for Life. (3) F, S

Physical fitness and benefits of exercise, with emphasis on self-evaluation and personalized program planning for a lifetime.

335 Biomechanics. (3) F, S, SS

Basic mechanical and anatomical principles applied to human movement. Emphasis is placed on kinematic and kinetic concepts. Prerequisites: MAT 117; ZOL 201.

340 Physiology of Exercise. (3) F, S, SS

Physiological mechanisms of acute responses and chronic adaptations to exercise. Prerequisites: CHM 101; ZOL 202.

345 Motor and Developmental Learning. (3) F, S, SS

Principles of motor skill acquisition across the life span, focusing on the learner and the learning environment. Prerequisites: PGS 101; ZOL 201.

348 Psychological Skills for Optimal Performance. (3) F, S, SS

Application of psychological techniques and their use to improve effectiveness and performance in sport and related areas.

352 Psychosocial Aspects of Physical Activity. (3) F, S, SS

Interrelationships between physical activity and psychosocial variables, including socialization, team-dynamics, cultural values, anxiety-aggression, and motivation. Prerequisite: PGS 101.

361 Physical Education in the Secondary School. (3) F, S

Current trends and theories, such as elective programs, coed classes, legal issues, contract teaching, curriculum, and administration.

370 Advanced First Aid. (3) N

Assessment, management, treatment of wounds, injuries, shock, poisoning, burns, sudden illness, emergency rescue, and cardiopulmonary resuscitation. Lecture, lab.

376 Physical Education for the Elementary School. (3) F, S

Scope and values of physical education in the elementary school. Methods, materials, and practice in teaching activities for primary, intermediate, and upper grades.

382 Physical Education for the Atypical Student. (3) F, S, SS

Survey course of handicapping conditions and adapting activities to meet the needs of the handicapped. Prerequisite: EPE 335 or instructor approval.

412 Biomechanics of the Skeletal System. (3) F

Biomechanics of tissues, structures, and major joints of the musculoskeletal system. Discussion of injury mechanisms. Lecture, discussion, some labs. Prerequisite: EPE 335 or instructor approval.

420 Exercise Testing. (3) F

Theoretical basis and practical application of screening, exercise testing, estimates of en-

ergy expenditure, and interpretation of results. Prerequisite: EPE 340.

425 Exercise Prescription. (3) S

Theoretical bases for and application of general principles of exercise prescription to various ages, fitness levels, and health states. Prerequisite: EPE 420.

441 Physiology of Women in Sport. (3) S

Physiological aspects of women engaging in physical activity. Factors affecting performance and health throughout life are emphasized. Prerequisite: EPE 340. *General Studies: L2.*

442 Physical Activity in Health and Disease. (3) F

The role of physical activity and physical fitness in the development of morbidity and mortality throughout the human life span. Prerequisites: EPE 340; ZOL 201, 202. *General Studies: L2.*

448 Applied Sport Psychology. (3) F, SS

Psychological theories and techniques applied to a sport to enhance the performance and personal growth of athletes and coaches. Lecture, discussion. Prerequisites: EPE 345 and 352 or equivalents. *General Studies: L2.*

450 History and Philosophy of Sport. (3) F, S, SS

Nature, purpose, and development of modern sporting and related activity. Prerequisite: HIS 102 or PHI 101.

480 Methods of Teaching Physical Education. (3) F, S

Methods of instruction, organization, and presentation of appropriate content in elementary and secondary physical education. Concurrent with student teaching or permission of instructor.

483 Evaluation in Physical Education. (3) F, S, SS

Analysis and construction of tests. Statistics as applied to tests and measurement in school-based and nonschool-based settings. Prerequisite: MAT 117.

485 Advanced Techniques of Athletic Training. (3) S

An advanced course in athletic training designed for students seeking NATA certification. Emphasis on therapeutic modalities and rehabilitation procedures. Prerequisites: EPE 283, 370; CPR certification.

500 Research Methods. (3) F

An introduction to the basic aspects of research, including problem selection, literature review, instrumentation, data handling, methodology, and the writing of research reports and articles.

501 Research Statistics. (3) S

Statistical procedures; sampling techniques; exercise testing, exercise prescription, hypothesis testing, and experimental designs as they relate to research publications.

505 Applied Exercise Physiology Techniques. (3) F '97

Investigative techniques used in the applied exercise physiology laboratory. Emphasis on pulmonary function, body composition, and cardiorespiratory assessment. Lecture, lab. Prerequisite: EPE 340.

510 Introduction to Biomechanics Research Methods. (3) F

Application of mechanics to human movement analysis. Includes consideration of two-dimensional imaging techniques, force measurement, electromyography, and data processing

methods. Lecture, discussion, some labs. Prerequisite: EPE 335 or instructor approval.

520 Sport Psychology. (4) F
Current research in sport psychology. Includes questionnaire, psychophysiological, and behavioral research techniques. Lecture, discussion. Prerequisites: EPE 448, 500.

521 Motor Development, Control, and Learning. (4) S '97
Theory and research on motor skill acquisition, including learning/control and development (i.e., growth, children and exercise, and development learning). Lecture, discussion, some labs. Prerequisites: EPE 345, 500, 501.

522 Exercise Psychology. (3) S
Contemporary research and theory as related to human behavior and health in an exercise setting. Lecture, discussion. Prerequisite: EPE 500.

530 Exercise Physiology. (3) F
Immediate and long-term adaptations to exercise with special reference to training and the role of exercise in cardiovascular health. Prerequisite: EPE 340.

531 Physiology of Women in Sport. (3) S
Physiological aspects of women engaging in physical activity. Factors affecting performance and health throughout life are emphasized. Prerequisite: EPE 340.

532 Environmental Aspects of Human Performance. (3) N
Physiological response mechanisms to desert, arctic, mountain, and undersea environments with emphasis on exercise performance. Prerequisite: EPE 530.

534 Sports Conditioning. (3) F
Bases of sports conditioning, including aerobic and anaerobic power, strength, flexibility, and analysis of conditioning components for sports.

535 Factors Influencing Exercise Performance. (3) S
Physiological factors that can affect the ability to exercise, and the body's response to exercise. Lecture, seminar. Prerequisite: EPE 530.

544 Fitness/Wellness Management. (3) F
Development of the fitness/wellness industry. Planning, organizing, promoting, and managing fitness/wellness programs.

550 Historical Bases of Physical Education. (3) N
Golden Age of Greece, Renaissance, and modern Europe. Cultural, economic, and educational forces that influenced the development of physical education, dance, and athletics in the United States.

555 Sport and the American Society. (3) F
Impact of sports upon the American culture, with focus on competition, economics, myths, minorities, and the Olympic syndrome.

560 Theory of Administration. (3) N
Administrative philosophies, development of concepts related to processes of administration, types of administrative behavior, tasks and responsibilities of the administrator, and the evaluation of the effectiveness of administration.

561 Administration of Athletics. (3) N
Managing an athletic program, including financing, budget policies, staging, and promotion of athletic contests, schedules, travel insurance, and current athletic trends.

570 Programs and Special Topics in Adapted Physical Education. (3) F
Contemporary adapted, developmental, remedial, and corrective physical education programs; understanding of principles, problems, and recent developments in this area.

571 Improving Sport Skills. (3) SS
Factors in successful motor performance in skills used in individual, dual, and team sports.

572 Trends and Issues in Physical Education. (3) S
Literature, research, and practices in contemporary physical education, including finances, Title IX, teaching and coaching philosophies, school organization, and nonteaching physical education programs.

573 Curriculum and Instruction in Secondary Physical Education. (3) F
Current curriculum and instruction practices and research in secondary school physical education. Prerequisite: ESPE major or teaching experience.

574 Analysis of Teaching Behavior in Sport and Physical Education. (3) N
Use of systematic, direct observation techniques in analyzing and evaluating instruction in sport and physical education. Lecture, lab.

575 Teaching Lifetime Fitness. (3) S
Organizing and implementing physical fitness programs in the schools with emphasis on individual problem solving.

576 Physical Education for Elementary School Children. (3) F
Current practices and research pertaining to elementary school physical education programs.

610 Advanced Topics in Biomechanics. (3) S
Three-dimensional imaging techniques, data analysis theory, and integration of biomechanics research tools; includes original research project. Lecture, discussion, some labs. Prerequisite: EPE 510 or instructor approval.

620 Developmental Motor Skill Acquisition. (3) S '97
Cognitive-motor theories of learning/performance applied to children's motor skill acquisition. Study of knowledge development and research analysis/techniques. Lecture, discussion. Prerequisite: EPE 521.

621 Motor Learning/Control. (3) F '97
Discussion of contemporary research issues in motor learning and control. Includes behavioral and neurophysiological issues. Lecture, discussion. Prerequisite: EPE 521.

630 Current Topics in Exercise Physiology. (3) F
Discussion of contemporary research issues in exercise physiology. Lecture, seminar. Prerequisites: EPE 505, 530, 531.

642 Exercise Epidemiology. (3) S '96
Physical activity, exercise, and physical fitness and the development of chronic disease. Not open to students who have taken EPE 442. Prerequisites: EPE 340, 500, 501.

Department of Family Resources and Human Development

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Chair
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PROFESSORS

FABES, HOOVER, MERMIS,
MORGAN, PETERSON, ROOSA

ASSOCIATE PROFESSORS

BALCAZAR, BOULIN-JOHNSON,
CHRISTOPHER, GRIFFIN,
HUGHSTON, JOHNSTON,
MANORE, C. MARTIN, MONTE,
VAUGHAN, WILSON

ASSISTANT PROFESSORS

DUMKA, MADDEN-DERDICH, PETERS

LECTURERS

R. MARTIN, WEIGAND

PROFESSORS EMERITI

BAKER, BARKLEY, BRESINA,
CREIGHTON, ELLSWORTH,
HUNTER, KAGY, O'CONNOR,
STANGE, WOOLDRIDGE

FAMILY RESOURCES AND HUMAN DEVELOPMENT— B.A. OR B.S.

For either the B.A. or B.S. degree in Family Resources and Human Development (see "Degree Requirements," page 107), students must select one of the following three concentrations shown in the "Family Resources and Human Development Concentrations and Options" table, page 136.

Family Resources and Human Development in Business

Food Service Management Option.

The food service management option consists of 22 hours of the following required departmental courses:

| | | | |
|-----|-----|---|---|
| FON | 100 | Introductory Nutrition | 3 |
| FON | 142 | Applied Food Principles..... | 3 |
| FON | 341 | Introduction to Planning Therapeutic Diets | 3 |
| FON | 343 | Food Service Systems Management | 3 |
| FON | 344 | Nutrition Services Management <i>LI</i> | 3 |

NOTE: For the General Studies requirement, codes (such as L1, N3, C, and H), and courses, see pages 71–94. For graduation requirements, see pages 66–70. Omnibus courses are offered that are not listed in the catalog; see pages 44–45.

Family Resources and Human Development Concentrations and Options

| Major | Concentration | Option |
|--|--|-----------------------------------|
| Family Resources and Human Development | Family resources and human development in business | Foods and food service management |
| | Family studies/child development | General dietetics |
| | Human nutrition—dietetics | Human nutrition |

FON 442 Experimental Foods.....4
 FON 445 Quantity Food Production3

In addition, the following courses are required:

CHM 101 Introductory Chemistry *S1/S2* 4
 CHM 231 Elementary Organic Chemistry *S1/S2*¹ 3
 CHM 235 Elementary Organic Chemistry Laboratory *S1/S2*¹ 1
 MIC 205 Microbiology *S2*² 3
 MIC 206 Microbiology Laboratory *S2*² 1

¹ Both CHM 231 and 235 must be taken to secure S1 or S2 credit.
² Both MIC 205 and 206 must be taken to secure S2 credit.

Also required is a ASM, CSE, or MAT course to satisfy computer application. Additional business courses are selected in consultation with an advisor.

Family Studies/Child Development

The concentration in family studies/child development consists of 33 hours of core courses:

CDE 232 Human Development *SB* 3
 CDE 430 Infant/Toddler Development in the Family *SB* 3
 CDE 498 Pro-Seminar.....6
 or FAS 498 Pro-Seminar (6)
 FAS 331 Marriage and Family Relationships *SB*..... 3
 FAS 332 Human Sexuality3
 FAS 361 Introduction to Family/Child Research Methods *L1*..... 3
 FAS 431 Parent-Adolescent Relationships3
 FAS 435 Advanced Marriage and Family Relationships *SB* 3
 FAS 436 Conceptual Frameworks in Family Studies.....3
 FAS 440 Fundamentals of Marriage and Family Therapy.....3

Also required is MAT 117 College Algebra and one of the following statistics courses:

EDP 454 Introduction to Statistical Data Analysis in Education *N2*..... 3
 PSY 230 Introduction to Statistics *N2*.. 3
 SOC 395 Social Statistics I *N2* 3

In addition, 15 hours of electives must be taken, with at least six hours from the following:

CDE 337 Theory and Practice in Child Development3
 CDE 338 Child Development Practicum.....2-4
 CDE 437 Observational and Naturalistic Methods of Studying Children *L2/SB* 3
 CDE 498 Pro-Seminar.....3
 or FAS 498 Pro-Seminar (3) or FAS 499 Independent Study (3)
 FAS 330 Personal Growth in Human Relationships *SB* 3
 FAS 390 Supervised Research Experience.....1-3
 FAS 432 Family Development3

The remaining courses are selected in consultation with an advisor.

Human Nutrition—Dietetics

The American Dietetic Association (ADA) has approved the human nutrition—dietetics concentration as a Didactic Program in Dietetics (DPD). Graduates of a DPD program may apply for dietetic internships or preprofessional practice programs to establish eligibility to write the Dietetic Registration examination. In addition to the required courses specified below, the following 11 hours are required by both the ADA and the Department of Family Resources and Human Development:

MIC 205 Microbiology *S2**.....3
 ZOL 201 Human Anatomy and Physiology I *S2*..... 4

ZOL 202 Human Anatomy and Physiology II4

*Both MIC 205 and 206 must be taken to secure S2 credit.

Additional courses required by the American Dietetic Association for completion of DPD requirements must be selected upon consultation with an advisor. Most of the DPD requirements also satisfy College of Liberal Arts and Sciences graduation requirements.

The following 22 hours of departmental courses are required:

FON 142 Applied Food Principles.....3
 FON 241 Human Nutrition3
 FON 440 Advanced Human Nutrition I.....3
 FON 441 Advanced Human Nutrition II.....3
 FON 442 Experimental Foods.....4
 FON 444 Diet Therapy.....3
 FRD 451 Field Experience.....3

General Dietetics Option. For the general dietetics option, additional departmental courses, totaling 15 hours, are required:

FON 341 Introduction to Planning Therapeutic Diets3
 FON 344 Nutrition Services Management *L1*..... 3
 FON 445 Quantity Food Production3
 FON 446 Human Nutrition Assessment Lecture/Laboratory3
 FON 448 Community Nutrition3

Human Nutrition Option. For the human nutrition option, FON 446 Human Nutrition Assessment Lecture/Laboratory (3) is required.

Family Resources and Human Development Minor

The minor in Family Resources and Human Development consists of 18 semester hours in which students must specialize in one of three emphases. These emphases consist of the following:

1. family studies/child development;
2. foods and nutrition in business; and
3. nutrition.

Each of these emphases requires that at least 12 of the 18 hours must be in upper-division courses.

Family Studies/Child Development.

The family studies/child development emphasis requires that students take the following courses:

- CDE 232 Human Development *SB* 3
- CDE 337 Theory and Practice in Child Development3
- FAS 331 Marriage and Family Relationships *SB*..... 3
- FAS 440 Fundamentals of Marriage and Family Therapy.....3

This emphasis also requires that two courses (or six semester hours) be selected from the following:

- CDE 430 Infant/Toddler Development in the Family *SB* 3
- CDE 437 Observational and Naturalistic Methods of Studying Children *L2/SB*..... 3
- CDE 498 Pro-Seminar.....3
- FAS 431 Parent-Adolescent Relationships3
- FAS 432 Family Development3

Foods and Nutrition in Business. The foods and nutrition in business emphasis requires that students take the following courses:

- FON 100 Introductory Nutrition3 or FON 241 Human Nutrition (3)
- FON 142 Applied Food Principles.....3
- FON 344 Nutrition Services Management *L1*..... 3
- FON 442 Experimental Foods.....4
- FON 445 Quantity Food Production3
- FRD 451 Field Experience.....1-12

Nutrition. The nutrition emphasis requires that students take the following courses:

- FON 241 Human Nutrition3
- FON 440 Advanced Human Nutrition I.....3
- FON 441 Advanced Human Nutrition II.....3
- FON 444 Diet Therapy.....3

Note that FON 440, 441, and 444 have prerequisites. This emphasis also requires that two courses (or six semester hours) be selected from among the following:

- FON 446 Human Nutrition Assessment Lecture/Laboratory3
- FON 448 Community Nutrition3
- FON 450 Nutrition in the Life Cycle I3

- FON 451 Nutrition in the Life Cycle II3
- FON 531 Recent Developments in Nutrition3
- FON 532 Current Research in Nutrition I.....3
- FON 533 Current Research in Nutrition II.....3

Note that FON 446, 531, 532, and 533 have prerequisites.

SECONDARY EDUCATION—B.A.E.

Family Resources and Human Development. The major teaching field consists of 42 semester hours in family resources and human development and six hours in interior design. Major courses required are as follows:

- CDE 232 Human Development *SB* 3
- CDE 337 Theory and Practice in Child Development3
- FAS 330 Personal Growth in Human Relationships *SB*..... 3
- FAS 331 Marriage and Family Relationships *SB*..... 3
- FAS 431 Parent-Adolescent Relationships3
- FON 100 Introductory Nutrition3
- FON 142 Applied Food Principles.....3
- FRD 451 Field Experience.....1-12
- HEE 461 Presentations in Home Economics3
- HEE 480 Methods of Teaching Home Economics3-4
- HEE 481 Teaching Occupational Home Economics3

Also required are two interior design courses.

The College of Education has additional requirements for teacher certification: Arizona Teacher Proficiency Exam (professional knowledge only); 35 hours of Professional Teacher Preparation; and the following courses:

- POS 110 Government and Politics *SB*.. 3 or POS 310 American National Government *SB* (3)
- POS 311 Arizona Constitution and Government *SB* 2 or POS 417 The Arizona Political System *SB* (3)

GRADUATE PROGRAMS

The Department of Family Resources and Human Development offers programs leading to the M.S. degree. Consult the *Graduate Catalog* for requirements.

CHILD DEVELOPMENT

CDE 232 Human Development. (3) F, S Life-span development from conception through adulthood, with emphasis on family influences. Recognition of individuality within the universal pattern of development. Prerequisites: PGS 101; SOC 101. *General Studies: SB.*

337 Theory and Practice in Child Development. (3) F, S Explores how child development theory affects practice with children and families, emphasizing development of preschool children and adult-child interaction skills. Prerequisite: CDE 232 or equivalent.

338 Child Development Practicum. (2-4) F, S Supervised practicum in the Child Development Lab preparing students for work in child care centers and agencies serving young children and families. Laboratory. Pre- or corequisite: CDE 337.

430 Infant/Toddler Development in the Family. (3) F An examination of the development of infants/toddlers, the socialization processes of families, and the interactions of these processes. Prerequisite: CDE 232 or equivalent. *General Studies: SB.*

437 Observational and Naturalistic Methods of Studying Children. (3) S In-depth examination of implementing observational and naturalistic studies of children in a variety of settings. 2 hours lecture, 3 hours lab. Prerequisites: CDE 430; 6 hours of psychology. *General Studies: L2/SB.*

531 Theoretical Issues in Child Development. (3) S Major developmental theories, related research, and their application to family interaction. Prerequisites: CDE 430 and 437 (or equivalent) or instructor approval.

533 Research Issues in Child Development. (3) S An in-depth exploration and critique of research focusing on child development in a family setting. Prerequisites: CDE 531; FRD 500.

534 Applied Child Development. (3) S Integration of child development research and theory to understand developmental problems and their relevance to intervention strategies. Prerequisites: CDE 531; FRD 500.

FAMILY STUDIES

FAS 301 Introduction to Parenting. (3) F, S Integrated approach to understanding parenting and parent-child interactions. Television course. Prerequisites: PGS 101; SOC 101 or equivalent.

330 Personal Growth in Human Relationships. (3) F, S Personal development and behavior as related to competency in interpersonal relationships within the family. Processes of family interaction. Prerequisites: PGS 101; SOC 101 or equivalent. *General Studies: SB.*

331 Marriage and Family Relationships. (3) F, S

Issues, challenges, and opportunities relating to present-day marriage and family living. Factors influencing interrelations within the family. Prerequisite: course in psychology or sociology. *General Studies: SB.*

332 Human Sexuality. (3) F, S

Relationship of sexuality to family life and to major societal issues. Emphasis on developing healthy, positive, and responsive ways of integrating sexual and other aspects of human living. Prerequisite: PGS 101.

361 Introduction to Family/Child Research Methods. (3) S

Examines basic methods applied to family/child research, critiques current research literature, and applies methods in current topics. Prerequisites: CDE 232; FAS 331. *General Studies: L1.*

370 Family Ethnic and Cultural Diversity. (3) S

An integrative approach to understanding historical and current issues related to the structure and internal dynamics of diverse American families. Prerequisite: PGS 101 or SOC 101.

390 Supervised Research Experience. (1–3) F, S, SS

Practical, firsthand experience within current faculty research projects in family studies or child development. “Y” grade only; may be repeated for total of 6 hours. Prerequisites: FAS 361; 3.00 GPA in major; approval of supervising faculty member before registration.

431 Parent-Adolescent Relationships. (3) F
Dynamics of the relationships between parents and adolescents. Developmental characteristics of adolescence and the corresponding adult stage. Prerequisites: CDE 232; FAS 331.

432 Family Development. (3) N

Normative changes in families over time from formation until dissolution. Emphasis on the marital subsystem in middle and later years. Prerequisites: CDE 232 and FAS 331 or instructor approval.

435 Advanced Marriage and Family Relationships. (3) F

Recent research, issues, and trends relating to marriage and family interaction. Influence of family composition, physical environment, family patterns, and values on family dynamics. Prerequisites: FAS 331, 361. *General Studies: SB.*

436 Conceptual Frameworks in Family Studies. (3) S

Approaches to study families focusing on systems, interactional, exchange, conflict, and developmental frameworks. Applications to diverse individual and family situations. Prerequisites: CDE 232; FAS 331, 361.

440 Fundamentals of Marriage and Family Therapy. (3) S

Introduction to the fundamental orientations of marriage and family therapy.

457 Third-World Women. (3) F

Economic, sociopolitical, and demographic context for understanding the roles of third-world women in health, family, work, education, and community. Prerequisite: 6 hours of social science credit or instructor approval.

530 Introduction to Marriage and Family Therapy. (3) F

Introduction of major marriage and family therapy orientations. Review history, theory, application, and outcome research for each orientation. Prerequisite: admission to M.S. program in FRHD with a concentration in family studies or instructor approval.

531 Family Theory Development. (3) S

Historical and current approaches to theory development, evaluation, and application in family studies. Prerequisite: FAS 435 or instructor approval.

535 Family Relationships in the Middle and Later Years. (3) N

Developmental processes and generational relationships of the family in the middle and later stages of the family life cycle. Prerequisites: CDE 232 and FAS 331 or instructor approval.

536 Dysfunctional Marriage and Family Relationships. (3) N

A critical review of current theory and empirical evidence connecting marital and family interaction patterns with aberrant behavior. Prerequisite: PGS 466 or PSY 573 or equivalent or instructor approval.

537 Interpersonal Relationships. (3) F

Critical examination of current theoretical and research developments in the area of interpersonal relationships. Applications for research and intervention emphasized. Prerequisite: FAS 435 or equivalent or instructor approval.

538 Advanced Techniques in Marriage and Family Therapy. (3) N

An in-depth review of assumptions and advanced techniques associated with contemporary marriage and family therapy approaches. Prerequisite: a graduate-level course in marriage and family therapy or instructor approval.

539 Research Issues in Family Interaction. (3) F

Critical review of current and past research in the area of family dynamics. Emphasizes interactional processes within the family. Prerequisite: FAS 435 or equivalent or instructor approval.

540 Assessment in Marriage and Family Therapy. (3) S

Instruction in the assessment and outcome evaluation of couples and families involved in marital and family therapy. Lecture, lab. Prerequisites: FRD 500 or equivalent; PSY 530; instructor approval.

580 Marriage and Family Therapy Practicum. (3) F, S

Supervised clinical experience in marriage and family therapy; includes development of assessment and outcome evaluation skills. Lecture, lab. Prerequisite: instructor approval.

- (a) First semester (3)
- (b) Second semester (3)
- (c) Third semester (3)

FOOD AND NUTRITION

FON 100 Introductory Nutrition. (3) F, S, SS
Basic concepts of human nutrition. Alternative diets and how food choices affect personal health. Prerequisite: nonmajor.

142 Applied Food Principles. (3) F, S
Applied scientific principles of food preparation and production. 2 hours lecture, 3 hours lab.

241 Human Nutrition. (3) F, S, SS

Principles of human nutrition relative to health. Emphasis on nutrients and the factors affecting their utilization in the human body. Prerequisite: CHM 101 or equivalent.

341 Introduction to Planning Therapeutic Diets. (3) S

Cultural, health, and economic aspects of diet planning. Computer and manual assessment of food composition. Review of common therapeutic diets. Prerequisites: FON 142, 241 (or equivalent).

343 Food Service Systems Procurement. (3) F

Food purchasing for institutions: cost factors, food laws, quality standards, and inventory control. Field trip may be required. Prerequisites: FON 142; MAT 106.

344 Nutrition Services Management. (3) S

Organization, administration, and management of food and nutrition services in hospitals and other institutions. Field trips may be included. Prerequisite: FON 343. *General Studies: L1.*

440 Advanced Human Nutrition I. (3) F

Metabolic reactions and interrelationships of vitamins, minerals, and water. CHM 332 recommended. Prerequisites: CHM 361; FON 241 or equivalent; ZOL 202.

441 Advanced Human Nutrition II. (3) S

Metabolic reactions and interrelationships of carbohydrate, lipid, and protein. CHM 331, 332 recommended. Prerequisites: CHM 361; FON 241 or equivalent; ZOL 202.

442 Experimental Foods. (4) F

Food product development techniques, food evaluation and testing, and investigation of current research into food composition. 2 hours lecture, 6 hours lab. Prerequisites: CHM 231; FON 142.

444 Diet Therapy. (3) S

Principles of nutritional support for prevention and treatment of disease. Prerequisites: FON 241 or equivalent; ZOL 202.

445 Quantity Food Production. (3) S

Standard methods of food preparation in quantity; operation of institutional equipment and menu planning for institutions. Experience in quantity food service. 1 hour lecture, 6 hours lab. May require field trips. Prerequisites: FON 241 (or equivalent) and 343 and 344 or instructor approval.

446 Human Nutrition Assessment Lecture/Laboratory. (3) S

Clinical and biochemical evaluation of nutritional status. 2 hours lecture, 3 hours lab. Prerequisites: CHM 367; FON 440 or 441.

448 Community Nutrition. (3) F

Food-related behaviors; community organization and delivery of nutrition services; program design, implementation, and evaluation strategies; nutritional assessment of population groups. PGS 101 and SOC 101 are recommended. Prerequisite: FON 241 or equivalent.

450 Nutrition in the Life Cycle I. (3) F

Emphasis on nutritional needs and problems during pregnancy, lactation, infancy, and childhood. Prerequisite: FON 241 or equivalent.

451 Nutrition in the Life Cycle II. (3) S

The nutritional requirements and nutrition-related disorders of adolescence, middle adulthood, and later life. Prerequisite: FON 241 or equivalent.

531 Recent Developments in Nutrition. (3) N

Survey of research. Prerequisites: 1 course each in advanced nutrition and biochemistry.

532 Current Research in Nutrition I. (3) S

Vitamins and minerals. Prerequisites: 1 course each in advanced nutrition and biochemistry.

533 Current Research in Nutrition II. (3) F

Carbohydrates, lipids, and proteins. Prerequisites: 1 course each in advanced nutrition and biochemistry.

538 Recent Developments in Foods. (3) N

Discussion and critique of current research. Prerequisite: FON 142.

540 Advanced Micronutrient Metabolism. (3) F

The metabolism of vitamins and minerals, primarily as applied to humans, with research literature emphasized. Prerequisites: 1 course each in basic nutrition and biochemistry.

541 Advanced Macronutrient Metabolism. (3) S

The metabolism of protein, fat, and carbohydrate, primarily as applied to humans, with research literature emphasized. Prerequisites: 1 course each in basic nutrition and biochemistry.

542 Advanced Food Product Development. (4) F

Principles of food product development and testing, including current government regulations. 2 hours lecture, 6 hours lab. Prerequisites: FON 142; inorganic chemistry.

544 Therapeutic Nutrition. (3) S

Current theories of the nutritional prevention or treatment of various diseases. Prerequisites: 1 course each in basic nutrition and physiology.

545 Recent Developments in Institutional Feeding. (3) S

Current practices in institutional feeding, including supervised practicum with local quantity food operation. 1 hour lecture, 6 hours lab. Prerequisites: FON 142 and 343 and 344 or instructor approval.

546 Assessment Techniques in Nutrition Research. (2) S

Current techniques in human nutrition research. Research literature is reviewed and critiqued. Lecture, lab. Prerequisites: CHM 361, 367; FON 440 or 441.

546L Laboratory Techniques in Nutrition Research. (1) S

Laboratory techniques required in nutrition research, including spectroscopy, chromatography, and RIA. Lab. Prerequisites: CHM 361, 367; FON 440 or 441.

548 Nutrition Program Development. (3) F

The planning, development, implementation, and evaluation of community nutrition programs, including the process of grant applications. Prerequisites: 1 course each in basic nutrition and sociology.

550 Advanced Maternal and Child Nutrition. (3) F

Metabolic characteristics and nutritional needs of the pregnant woman, lactating woman, infant, and child are reviewed in-depth. Prerequisites: 1 course each in basic nutrition, physiology, and biochemistry.

551 Advanced Geriatric Nutrition. (3) S

Metabolic characteristics and nutritional requirements of the elderly are reviewed in depth. Prerequisites: 1 course each in basic nutrition, physiology, and biochemistry or instructor approval.

580 Dietetics Practicum. (3-9) F, S, SS

Structured practical experience in the Preprofessional Practice Program (AP4), supervised by practitioners with whom the student works closely. Practicum. Prerequisite: acceptance into the AP4 program.

FAMILY RESOURCES AND HUMAN DEVELOPMENT

FRD 330 Research Issues in the Family. (3) N

Study of current research issues in various areas that affect family life and individuals within families. Prerequisites: major; junior standing.

451 Field Experience. (1-12) N

Supervised field placement in the area of student's concentration with a community business or agency. Students must make arrangements with instructor 1 semester in advance of enrollment. Prerequisites: completion of 60 hours; instructor approval.

500 Research Methods. (4) F

Purposes of research. Experimental design, methods of data collection, and thesis proposal development. Includes practical application research laboratory. 3 hours lecture, 3 hours lab.

HOME ECONOMICS EDUCATION

HEE 461 Presentations in Home Economics. (3) F

Presentation and demonstration techniques in teaching home economics. Development of audiovisual materials for home economics content areas. Prerequisites: junior standing; instructor approval.

480 Methods of Teaching Home Economics. (3-4) F

Instruction, organization, presentation, and evaluation of subject matter in home economics. HEE students register for 4 semester hours. Dietetic students register for 3 semester hours.

481 Teaching Occupational Home Economics. (3) S

Career orientation related to home economics, cooperative work-related instruction, programs, and youth club advisement associated with secondary home economics programs. May include field trips. Prerequisite: Family Resources and Human Development major or minor.

582 Program Planning in Home Economics. (3) S

Planning and development of home economics programs.

583 Program Evaluation in Home Economics. (3) F

Theories and processes of program evaluation. Prerequisite: HEE 582.

585 Administration and Supervision of Home Economics Education. (3) N

Development of individuals for state, city, school, and college leadership roles. Emphasis on supervision of student teachers.

586 Current Trends of Teaching Home Economics. (3) N

Focus on teaching home economics related to current issues and problems facing families and society. Prerequisite: Family Resources and Human Development major or minor.

Department of Geography

Anthony J. Brazel
Chair
(COB 338) 602/965-7533

REGENTS' PROFESSOR
GRAF

PROFESSORS

ARREOLA, BRAZEL, BURNS, COMEAUX, GOBER, MARCUS, McTAGGART, PASQUALETTI

ASSOCIATE PROFESSORS

ALDRICH, BALLING, CHERVENY, DORN, KUBY, McHUGH, MINGS, O'HUALLACHAIN

ASSISTANT PROFESSORS

FALL, SIERRA

PROFESSORS EMERITI

ACKER, DURRENBERGER, FROST, HENKEL, LOUNSBURY, SARGENT, WEIGEND

GEOGRAPHY—B.A. OR B.S.

Both B.A. and B.S. degrees in Geography consist of 45 semester hours. The required courses are as follows:

| | | |
|---------|---|---|
| GCU 102 | Introduction to Human Geography <i>SB</i> | 3 |
| GCU 121 | World Geography <i>SB, G</i> | 4 |
| GCU 495 | Quantitative Methods in Geography <i>N2</i> | 3 |
| GCU 496 | Geographic Research Methods <i>L2</i> | 3 |
| GPH 111 | Introduction to Physical Geography <i>S1/S2</i> | 3 |
| | or GPH 411 Physical Geography (3) | |
| GPH 371 | Cartography..... | 3 |
| GPH 491 | Geographic Field Methods | 6 |

NOTE: For the General Studies requirement, codes (such as L1, N3, C, and H), and courses, see pages 71-94. For graduation requirements, see pages 66-70. Omnibus courses are offered that are not listed in the catalog; see pages 44-45.

Also required are an additional three- or four-hour GPH course and an additional three-hour GCU course. A further four to six hours of electives must be chosen, for a total of 36 hours in geography. The remaining nine hours are to be made up of electives from related fields of study, chosen in consultation with an advisor. At least 18 hours must be in upper-division courses.

Asian Studies Emphasis. Students majoring in Geography may elect to pursue an Asian studies emphasis combining courses from the major with selected outside courses of wholly Asian content. For more information, see "Asian Studies," pages 110–111, and "Southeast Asian Studies," page 112.

Latin American Studies Emphasis. Students majoring in Geography may elect to pursue a Latin American studies emphasis combining courses from the major with selected outside courses of wholly Latin American content. See "Latin American Studies," page 111, for more information.

SPECIAL EMPHASIS PROGRAMS

Two special emphasis programs, meteorology-climatology and urban studies, are optional. Students who wish to graduate with a B.A. or B.S. degree in Geography are not obligated to choose one of these emphases.

Meteorology-Climatology Emphasis. The required courses for the meteorology-climatology emphasis are as follows:

| | | |
|---------|---|---|
| GCU 102 | Introduction to Human Geography <i>SB</i> | 3 |
| GCU 121 | World Geography <i>SB, G</i> | 4 |
| GCU 495 | Quantitative Methods in Geography <i>N2</i> | 3 |
| GCU 496 | Geographic Research Methods <i>L2</i> | 3 |
| GPH 111 | Introduction to Physical Geography <i>SI/S2</i> | 3 |
| | or GPH 411 Physical Geography (3) | |
| GPH 213 | Introduction to Meteorology II | 3 |
| GPH 215 | Introduction to Meteorology Laboratory II | 1 |
| GPH 371 | Cartography..... | 3 |
| GPH 409 | Synoptic Meteorology I..... | 4 |
| GPH 410 | Synoptic Meteorology II | 4 |
| GPH 412 | Physical Climatology | 3 |
| | or GPH 413 Meteorological Instruments and Measurement (3) | |
| | or GPH 414 Climate Change (3) | |
| GPH 491 | Geographic Field Methods | 6 |

Students must also choose one other three-hour course in GCU. Also required are the following related courses:

| | | |
|---|--|----------|
| Choose between the two combinations of courses below..... | | 12 or 10 |
| MAT 270 | Calculus with Analytic Geometry I <i>NI</i> (4) | |
| MAT 271 | Calculus with Analytic Geometry II (4) | |
| MAT 272 | Calculus with Analytic Geometry III (4) | |
| — or — | | |
| MAT 290 | Calculus I <i>NI</i> (5) | |
| MAT 291 | Calculus II (5) | |
| PHY 121 | University Physics I: Mechanics <i>SI/S2</i> ¹ | 3 |
| PHY 122 | University Physics Laboratory I <i>SI/S2</i> ¹ | 1 |
| PHY 131 | University Physics II: Electricity and Magnetism <i>SI/S2</i> ² | 3 |
| PHY 132 | University Physics Laboratory II <i>SI/S2</i> ² | 1 |

¹ Both PHY 121 and 122 must be taken to secure S1 or S2 credit.
² Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

Urban Studies Emphasis. The required courses for the urban studies emphasis are as follows:

| | | |
|---------|---|---|
| GCU 102 | Introduction to Human Geography <i>SB</i> | 3 |
| GCU 121 | World Geography <i>SB, G</i> | 4 |
| GCU 357 | Social Geography <i>SB</i> | 3 |
| GCU 361 | Urban Geography <i>SB</i> | 3 |
| GCU 444 | Applied Urban Geography | 3 |
| GCU 495 | Quantitative Methods in Geography <i>N2</i> | 3 |
| GCU 496 | Geographic Research Methods <i>L2</i> | 3 |
| GPH 111 | Introduction to Physical Geography <i>SI/S2</i> | 3 |
| | or GPH 411 Physical Geography (3) | |
| GPH 213 | Introduction to Meteorology II..... | 3 |
| GPH 215 | Introduction to Meteorology Laboratory II | 1 |
| GPH 371 | Cartography..... | 3 |
| GPH 491 | Geographic Field Methods | 6 |

In addition, students must select two courses from the following:

| | | |
|---------|--|---|
| GCU 351 | Population Geography <i>SB</i> | 3 |
| GCU 359 | Cities of the World I <i>G</i> | 3 |
| | or GCU 360 Cities of the World II <i>G</i> (3) | |
| GCU 364 | Geography of Energy | 3 |
| GCU 441 | Economic Geography..... | 3 |
| GCU 442 | Geography of Transportation <i>SB</i> | 3 |
| GCU 453 | Recreational Geography | 3 |

| | | |
|---------|---|---|
| GCU 461 | Geographic Applications of Urban and Regional Planning..... | 3 |
| GPH 481 | Environmental Geography | 3 |

If GPH 481 is not selected, a further three-hour GPH course is required. Nine hours in fields related to geography must be in urban-oriented course work.

OFFICE OF CLIMATOLOGY

Dr. R.C. Balling is director of the Office of Climatology. The office performs pure and applied climatic research and supports undergraduate and graduate students at ASU. The office maintains an extensive archive of climatic and meteorologic information on Arizona and the western United States.

SECONDARY EDUCATION—B.A.E.

Geography. The major teaching field consists of 45 semester hours, of which a minimum of 30 must be in geography and 15 in a related teaching field or fields. The following courses are required:

| | | |
|---------|---|---|
| GCU 102 | Introduction to Human Geography <i>SB</i> | 3 |
| GCU 121 | World Geography <i>SB, G</i> | 4 |
| GPH 111 | Introduction to Physical Geography <i>SI/S2</i> | 4 |
| | or GPH 411 Physical Geography (3) | |

In conjunction with an advisor, students choose remaining credits from three groups of human, physical, and regional courses.

Social Studies. See page 188.

GRADUATE PROGRAMS

The Department of Geography offers programs leading to the M.A. and Ph.D. degrees. Consult the *Graduate Catalog* for requirements.

CULTURAL GEOGRAPHY

GCU 102 Introduction to Human Geography. (3) F, S
 Systematic study of human use of the earth. Spatial organization of economic, social, political, and perceptual environments. *General Studies: SB.*

121 World Geography. (4) F, S
 Description and analysis of areal variations in social, economic, and political phenomena in major world regions. *General Studies: SB, G.*

- 141 Introduction to Economic Geography.** (3) F
Production, distribution, and consumption of various types of commodities of the world and relationships to the activities of humans. *General Studies: SB.*
- 240 Introduction to Southeast Asia.** (3) F
An interdisciplinary introduction to the cultures, religions, political systems, geography, and history of Southeast Asia. Cross-listed as ASB 240/HIS 240/POS 240/REL 240. *General Studies: G.*
- 253 Introduction to Cultural and Historical Geography.** (3) A
Cultural patterns, including such phenomena as language, religion, and various aspects of material culture. Origins and diffusion and division of the world into cultural areas. *General Studies: SB, G.*
- 294 Special Topics.** (4) A
Topics include global awareness.
- 322 Geography of U.S. and Canada.** (3) A
Spatial distribution of relevant physical, economic, and cultural phenomena in the United States and Canada. *General Studies: SB.*
- 323 Geography of Latin America.** (3) F
Spatial distribution of relevant physical, economic, and cultural phenomena in South, Middle, and Caribbean America. *General Studies: SB, G.*
- 325 Geography of Europe.** (3) N
Spatial distribution of relevant physical, economic, and cultural phenomena in Europe. Recommended for social studies teachers and students of European history. *General Studies: SB, G.*
- 326 Geography of Asia.** (3) F
Spatial distribution of relevant physical, economic, and cultural phenomena in Asia, excluding the former Soviet Union. *General Studies: SB, G.*
- 327 Geography of Africa.** (3) N
Spatial distribution of relevant physical, economic, and cultural phenomena in Africa. *General Studies: SB, G.*
- 328 Geography of Middle East and North Africa.** (3) A
Spatial distribution of relevant physical, economic, and cultural phenomena in the Middle East and North Africa. Prerequisite: GCU 121 or instructor approval. *General Studies: SB, G.*
- 332 Geography of Australia and Oceania.** (3) A
Spatial distribution of relevant physical, economic, and cultural phenomena in Australia, New Zealand, and Pacific Islands. *General Studies: G.*
- 344 Geography of Hispanic Americans.** (3) S
Examines the homelands, migrations, settlements, landscapes, roles, and selected cultural traditions of Hispanic Americans. *General Studies: C.*
- 350 The Geography of World Crises.** (3) F, S
Contemporary world crises viewed from a perspective of geographic concepts and techniques. *General Studies: SB, G.*
- 351 Population Geography.** (3) F
Demographic patterns; spatial, temporal, and structural investigation of the relationship of demographic variables to cultural, economic, and environmental factors. *General Studies: SB.*
- 352 Political Geography.** (3) N
Relationship between the sociophysical environment and the state. *General Studies: SB, G.*
- 357 Social Geography.** (3) A
Environmental perception of individuals and groups. The spatial aspect of social and physical environments is stressed. *General Studies: SB.*
- 359 Cities of the World I.** (3) N
Historical evolution of urban patterns and structures in the Middle East, India, Southeast Asia, China, Japan, and Europe. *General Studies: G.*
- 360 Cities of the World II.** (3) N
Historical evolution of urban patterns and structures in Latin America, North America, Sub-Saharan Africa, and Australasia. *General Studies: G.*
- 361 Urban Geography.** (3) F, S
External spatial relations of cities, internal city structure, and spatial aspects of urban problems in various parts of the world, particularly in the United States. *General Studies: SB.*
- 364 Geography of Energy.** (3) F
Production, transportation, and consumption of energy, emphasizing the electric power industry and its environmental problems.
- 421 Geography of Arizona and Southwestern United States.** (3) F
Prerequisite: GCU 323 or instructor approval. *General Studies: SB, G.*
- 423 Geography of South America.** (3) S
Prerequisite: GCU 323 or instructor approval. *General Studies: SB, G.*
- 424 Geography of Mexico and Middle America.** (3) A
Central America and Mexico. Prerequisite: GCU 323 or instructor approval. *General Studies: SB, G.*
- 425 Geography of the Mexican-American Borderland.** (3) S
Geography of a binational and bicultural region. Examination of settlement, boundary issues, ethnic subregions, population change, industrial development, and urban growth. *General Studies: L2, G.*
- 426 Geography of the Former Soviet Union.** (3) N
Prerequisite: GCU 121 or instructor approval. *General Studies: SB, G.*
- 433 Geography of Southeast Asia.** (3) S
Examines the biophysical and social features of Southeast Asian nations and peoples. Prerequisite: GCU 326 or instructor approval.
- 441 Economic Geography.** (3) S
Spatial distribution of primary, secondary, and tertiary economic and production activities. Prerequisite: GCU 141 or instructor approval.
- 442 Geography of Transportation.** (3) N
Geographic analysis of world trade routes and transportation systems. Prerequisite: GCU 141 or 441. *General Studies: SB.*
- 444 Applied Urban Geography.** (3) S
Designed to prepare the student for employment in planning agencies. Includes application of urban geographic principles to present-day planning problems. Prerequisite: GCU 361.
- 453 Recreational Geography.** (3) N
Examination of problems surrounding the organization and use of space for recreation. Introducing geographic field survey methods of data collection and analysis. Saturday field trips may be required.
- 455 Historical Geography of U.S. and Canada.** (3) N
Changing geography of the United States and Canada from pre-Columbian times to about 1900. Emphasis on evolving economic patterns. Recommended for social studies teachers and students of American history.
- 474 Federal Public Land Policy.** (3) F
Geographic aspects of federal public lands, policy, management, and issues. Emphasis on western wilderness and resource development problems.
- 495 Quantitative Methods in Geography.** (3) F, S
Statistical techniques applied to the analysis of spatial distributions and relationships. Introduction to models and theory in geography. Prerequisite: MAT 119. *General Studies: N2.*
- 496 Geographic Research Methods.** (3) F, S
Scientific techniques used in geographic research. Prerequisites: GCU 495; GPH 371, 491. *General Studies: L2.*
- 515 Human Migration.** (3) F
Economic, political, social, and geographic factors underlying population movements. Migration selectivity, streams and counter-streams, labor migration, and migration decision making. Lecture, seminar. Prerequisite: GCU 351 or instructor approval.
- 526 Spatial Land-Use Analysis.** (3) N
Determination, classification, and analysis of spatial variations in land-use patterns. Examination of the processes affecting land-use change. Prerequisite: 15 hours of geography or instructor approval.
- 529 Contemporary Geographic Thought.** (3) S '97
Comparative evaluation of current philosophy concerning the nature and trends of geography. Prerequisites: 15 hours of geography; instructor approval.
- 585 Advanced Research Methods in Geography.** (3) F
Specialized research techniques and methodologies in economic, political, or cultural geography.
- 591 Seminar.** (1–3) F, S, SS
Selected topics in economic, political, or cultural geography. Field trips may be required.
- 596 History of Geographic Thought.** (3) S '98
Development of geographic thought from Herodotus and Strabo to Humboldt and Ritter.

PHYSICAL GEOGRAPHY

GPH 111 Introduction to Physical Geography. (4) F, S

Spatial and functional relationships among climates, landforms, soils, water, and plants. 3 hours lecture, 3 hours lab. Field trips are required. *General Studies: S1/S2.*

210 Physical Environment. (3) F

Principles of physical geography relating to environmental problems pertinent to contemporary society. Pollution, maladjusted land use, and resource exploitation.

211 Landform Processes. (3) S

Geographic characteristics of landforms and earth-surface processes, emphasizing erosion, transportation, deposition, and implications for human management of the environment. Prerequisite: GPH 111. *General Studies: L1.*

212 Introduction to Meteorology I. (3) F

Fundamentals of weather and climate, including basic atmospheric processes and elements. Students whose curricula require a laboratory course must also register for GPH 214. Prerequisite: GPH 111 or instructor approval. *General Studies: S2 (if credit also earned in GPH 214).*

213 Introduction to Meteorology II. (3) S

Fundamentals of meteorological analysis, including basic terminology and symbology. Prerequisite: GPH 212 or instructor approval.

214 Introduction to Meteorology Laboratory I. (1) F

Introduction to basic meteorological and climatological measurements. 3 hours lab. May be taken concurrently with GPH 212. *General Studies: S2 (if credit also earned in GPH 212).*

215 Introduction to Meteorology Laboratory II. (1) S

Basic meteorological map analysis and interpretation. 3 hours lab. May be taken concurrently with GPH 213.

271 Maps and Map Reading. (3) A

Techniques of interpretation of different types of maps and map projections; history of mapping. 2 hours lecture, 3 hours lab.

371 Cartography. (3) F, S

Basic map drafting, grid compilation, simple design, and use of cartographic instruments. 6 hours lab, field trips. Prerequisite: GPH 111.

372 Air Photo Interpretation. (3) S

Aerial photographs as a means of determining topography, vegetation, and culture; scale, use of index, vertical and oblique photographs, and stereoscopes. Prerequisites: GPH 111, 211.

373 Cartographic Design. (3) A

Optimizing the communication of spatial information and concepts. Includes cartographic decision making, symbolism, perceptions, color, topography, projections, and scale. Prerequisites: GPH 371; instructor approval.

381 Geography of Natural Resources. (3) A

Nature and distribution of natural resources and the problems and principles associated with their use. *General Studies: SB.*

401 Topics in Physical Geography. (1–3) A

Open to students qualified to pursue independent studies. Field trips may be required. Prerequisite: instructor approval.

405 Energy and Environment. (3) S

Sources, regulatory and technical controls, distribution, and consequences of the supply and human use of energy. Prerequisite: courses in the physical or life sciences or instructor approval.

409 Synoptic Meteorology I. (4) F '97

Diagnostic techniques and synoptic forecasting. Includes techniques of weather analysis, map interpretation, and satellite and radar analysis. Prerequisites: MAT 270; PHY 131, 132.

410 Synoptic Meteorology II. (4) S '98

Diagnostic techniques and synoptic forecasting. Includes techniques of weather analysis, map interpretation, and satellite and radar analysis. Prerequisite: GPH 409.

411 Physical Geography. (3) A

Introduction to physiography and the physical elements of the environment. Open only to students who have not taken GPH 111. Field trips.

412 Physical Climatology. (3) A

Physical processes in the earth-atmosphere system on regional and global scales; concepts and analysis of energy, momentum, and mass balances. Prerequisites: GPH 212 and 213 or instructor approval.

413 Meteorological Instruments and Measurement. (3) N

Design and operation of ground-base and aerological weather measurement systems. Collection, reduction, storage, retrieval, and analysis of data. Field trips are required. Prerequisites: GPH 212 and 213 or instructor approval.

414 Climate Change. (3) S

Processes that produce variations in climate over time and space. Includes changes in climate produced by human and natural forces and involves the analysis of climatic data to identify temporal and spatial variations. Prerequisite: GPH 212 or instructor approval.

418 Landforms of the Western United States. (3) A

Study landforms and geomorphic processes in the western United States, including lecture, topographical maps, aerial photographs, satellite imagery, and field trips. Lecture, critical inquiry, laboratory, field work. Prerequisites: GPH 211 or equivalent; completion of L1 class. *General Studies: L2.*

433 Alpine and Arctic Environments. (3) S

Regional study of advantages and limitations of the natural environment upon present and future problems involving resource distribution, human activities, and regional and inter-regional adjustments. Field trips are required. Prerequisite: GPH 111 or instructor approval.

471 Geographic Information Systems. (3) F, S

GIS as a basis for microcomputer spatial analysis and synthesis. Includes digitizing, database organization, spatial retrieval, and graphics. Prerequisite: instructor approval.

474 Dynamic Meteorology I. (3) F '96

Large-scale atmospheric motion, kinematics, Newton's laws, wind equation, baroclinics, vorticity, and the midlatitude depression. Prerequisites: GPH 213, 215; MAT 271; PHY 131, 132.

475 Dynamic Meteorology II. (3) S '97

Topics in climate dynamics. General circulation, numerical modeling, teleconnection phenomena, and surface-atmosphere interaction. Prerequisite: GPH 474 or instructor approval.

481 Environmental Geography. (3) A

Problems of environmental quality, including uses of spatial analysis, research design, and field work in urban and rural systems. Field trips are required. Prerequisite: instructor approval.

491 Geographic Field Methods. (6) S '96, SS

Field techniques, including use of aerial photos, large-scale maps, and fractional code system of mapping; urban and rural field analysis to be done off campus. Travel fees required. Prerequisites: GCU 102, 121; GPH 111.

511 Fluvial Processes. (3) F

Geographic aspects of fluvial geomorphology, with emphasis on river channel change, fluvial erosion, and sedimentation in the present environment. Prerequisites: GLG 101 (or GPH 111), 362 (or GPH 211).

533 Snow and Ice. (3) S '97

Processes, distribution, climatic interactions of snow/ice emphasizing mass balance, snow stratigraphy/metamorphism and glacier/snow-pack climatology. Lecture, field work. Prerequisite: instructor approval.

571 Computer Mapping and Graphics. (3) N

Utilization of the digital computer in analysis and mapping of geographic data. Includes plotting, surficial display, compositing, and graphics. Field trips. Prerequisites: GPH 371; instructor approval.

575 Geographic Applications of Remote Sensing. (3) N

Use of imaging and nonimaging methods of remote acquisition of data, including satellite sensors, airborne radar, multiband scanning, conventional photographic sensors, and ground-based equipment. Field trips are required. Prerequisites: GCU 585 (or GPH 491); GPH 372.

591 Seminar. (1–3) F, S

Selected topics in physical geography. Field trips may be required.