111. College Algebra
Fall, Winter, Spring. 5(5-0) LBS 110 or MTH 109, MTH 110, LBS 124 concurrently. Not open to students with credit in MTH 112.
Theory and applications of derivatives to polynomials, rational functions, trigonometric functions, and their inverses, logarithmic and exponential functions, and inverse functions. Definition and properties of the definite integral. Numerical approximations of definite integrals.

112. Calculus I
Fall, Winter, Spring. 5(5-0) LBS 110 or MTH 110; LBS 124 concurrently. Not open to students with credit in MTH 112.
Further applications of the derivative to related rates, approximations including Newton’s method and graphing. The mean value theorem. Integration techniques, applications, and improper integrals. The conics and polar coordinates.

124. APL-Computer Programming for Scientists
Fall, Winter, Spring. 3(3-0) LBS 112 or concurrently. Interdepartmental with the Department of Computer Science.
APL programming; interactive programming techniques; arithmetic, logical, and extended APL operators; functions; applications to concurrent topics in mathematics; principles of operations of time-shared computers.

131. Third Culture Rhetoric I
Fall, Winter. 4(4-0)
Instruction and practice in expository writing. Paper and report topics drawn from readings which relate science and human values.

132. Third Culture Rhetoric II
Winter, Spring. 4(4-0) LBS 131.
Continuation of LBS 131 with emphasis upon investigative papers. Selected students may meet course requirements through independent study.

140. Biology I
Winter, Spring. 4(3-3) Not open to students with credit in B S 212.
The organisms and their environment. Organismal level of organization. Evolution and adaptation as forces for biological variance.

141. Biology II
Fall, Spring. 4(3-3) LBS 140, not open to students with credit in B S 210.
Cellular structure and function. Maintenance and manipulation of materials, energy, space and information at the cellular and tissue level of organization.

142. Biology IA
Winter, Spring. 1 to 2 credits. May reenroll for a maximum of 4 credits. LBS 140 or concurrently.
Selected problems such as analysis of biological data, interspecific and intraspecific competition, micr-organisms inhabiting leaf litter, spring flora, diversity, stability and evolution of natural communities.

143. Biology IIA
Fall, Spring. 2 credits. May reenroll for a maximum of 4 credits if different topic is taken. LBS 141 or concurrently.
Selected biology problems considering such topics as genetics, bacterial culturing and staining techniques, photosynthesis and histological techniques.

160. Physics–Elementary Concepts
(150.) Winter. 1(2-0) LBS 162 or concurrently.
Elementary concepts of mechanics, electricity, magnetism and optics.

161. Introduction to Chemistry and Physics I
Fall. 3(4-0) MTH 108 or MTH 109 or MTH 111 or LBS 111 concurrently; LBS 161L or concurrently or approval of instructor.
Gases and gas laws, kinetic theory, heat and thermodynamics. Equilibrium, solutions, acids and bases, ionization and electrolysis.

161L. Introductory Chemistry Laboratory
Fall, 1(0-3) LBS 161 or concurrently or approval of instructor.
Techniques and instruments in the chemistry laboratory. Includes qualitative, quantitative and synthetic work.

162. Introduction to Chemistry and Physics II
Winter. 3(4-0) LBS 161; LBS 162L or concurrently or approval of instructor.
Basic concepts of atomic and nuclear structure, wave particle duality, the quantum theory and the special theory of relativity. Radioactivity, nuclear reactions and elementary particle physics.

162L. Introductory Physics Laboratory
Winter. 1(0-3) LBS 162 or concurrently or approval of instructor.
Introduction to techniques and instruments in the physics laboratory. Selected experiments in classical and modern physics.

163. Introduction to Chemistry and Physics III
Spring. 3(4-0) LBS 162; LBS 163L or concurrently or approval of instructor.
Periodic properties and chemical families, stoichiometry, modern theory of chemical bonding, molecular orbitals. Chemical dynamics and equilibria, some organic chemistry nomenclature and reaction kinetics.

163L. Introductory Chemistry Laboratory
Spring. 1(0-3) LBS 163 or concurrently or approval of instructor.
Continuation of LBS 161.

216. Calculus III
Fall, Winter, Spring. 5(5-0) LBS 113.
Series, sequences, power series including Taylor series, and indeterminate forms. Graphing and vector geometry in 3-spaces. Differential calculus of functions of several variables through Taylor series and extreme points.

217. Calculus IV
Fall, Winter, Spring. 5(5-0) LBS 216.
Credit may not be earned in both LBS 217 and MTH 310.

235. Special Topics in Third Culture Rhetoric
Fall, Winter, Spring. 1 to 2 credits. May reenroll for a maximum of 6 credits. LBS 132.
Guided study of relations between the humanities and sciences. Students submit written work.

For prerequisite purposes the introductory biology sequence LBS 140, 141, 242 may be used in place of Biological Science 210, 211, 212.

256. Energy Consumption and Environmental Quality (N)
Spring. 3(3-0) Interdepartmental with and administered by the Department of Physics.
The role of energy as a fundamental pollutant will be discussed along with the availability of fossil energy sources. Limitations on the safe utilization of both fossil and nuclear energy will also be considered.

A-131
261. Introduction to Chemistry and Physics IV
Fall. 3(4-0) LBS 163; LBS 261 or concurrently or approval of instructor; LBS 112 or MTH 112 recommended. Kinetics and dynamics of classical particle and rigid body motion. Fundamentals of atomic, molecular vibration-rotation and nuclear magnetic resonance spectroscopy.

261L. Introductory Physics Laboratory
Fall. 1(0-3) LBS 261 or concurrently or approval of instructor. Continuation of LBS 162L.

262. Introduction to Chemistry and Physics V
Winter. 3(4-0) LBS 261; LBS 262L or concurrently or approval of instructor.
Chemistry of non-metals, transitional elements and coordination compounds, some organic chemistry. The major emphasis is on descriptive chemistry using principles developed in LBS 161, LBS 162, and LBS 163.

262L. Introductory Chemistry Laboratory
Winter. 1(0-3) LBS 262 or concurrently or approval of instructor. Continuation of LBS 163L.

263. Introduction to Chemistry and Physics VI
Spring. 3(4-0) LBS 261; LBS 263L or concurrently or approval of instructor.
Classical theory of electricity and magnetism. Electromagnetic wave motion and wave optics. Selected topics in solid state physics, and the special and general theories of relativity.

263L. Introductory Physics Laboratory
Spring. 1(0-3) LBS 263 or concurrently or approval of instructor. Continuation of LBS 261L.

290. Directed Study
Fall, Winter, Spring. 1 to 6 credits. May reenroll for a maximum of 6 credits. Approval of school.
Faculty directed studies in curricular areas which are normally related to regular course offerings.
A. Directed Study--General
1 or 2 credits.
B. Directed Study--Biology
1 or 2 credits.
C. Directed Study--Chemistry/Physics
1 or 2 credits.
D. Directed Study--Computer Science
1 to 3 credits.

295. Independent Study
Fall, Winter, Spring. 1 to 4 credits. May reenroll for a maximum of 12 credits. Approval of school.
Student conceived individual courses of study in curricular areas. Preliminary faculty approval and continuing guidance required.
A. Independent Study--General
B. Independent Study--Biology
C. Independent Study--Chemistry/Physics
D. Independent Study--Mathematics
E. Independent Study--Science Studies

331. Modern Fiction
Fall. 4(4-0) LBS 132 or LBS 131 with a 3.0 or better.
Recent fiction and its cultural backgrounds, particularly those of special value to students of science. Students may submit original fiction in partial fulfillment of course writing requirements.

332. Modern Drama
Winter. 4(4-0) LBS 132 or LBS 131 with 3.0 or better.
Recent plays which have social and literary significance. Students may submit original dramatic writings as partial fulfillment of course writing requirements.

333. Modern Poetry
Spring. 4(4-0) LBS 132 or LBS 131 with 3.0 or better.
Recent poetry of literary and social nature. Students may submit original poetry to partial fulfillment of course writing requirements.

344. Introductory Animal Systematics Laboratory
Fall. 2(1-3) LBS 261L. (3 credits concurrently. Interdepartmental with the Department of Zoology.
Laboratory examination of form and function of representative vertebrate and invertebrate animals.

361. Philosophy of Technology
Fall, Winter. 4(4-0) Sophomores or approval of school. Interdepartmental with the Department of Philosophy.
Is our technology desirable? Are its social forms desirable? What alternatives are there? Students will develop and defend their own appraisals of technology.

372. Introduction to Symbolic Logic
Fall, Winter. 4(4-0) Sophomores or approval of school.
Concepts, notation and application of truth-functional and quantificalional logic. Special topics may include axiomatics, meta-theory, modal logic, fallacies, paradoxes, inductive argument, the justification of logic.

373. Introduction to the Philosophy of Science
Winter, Spring. 4(4-0) Juniors or approval of school.
Philosophical problems about the character and justification of scientific knowledge. Possible topics: concept formation, theory construction, scientific explanation, confirmation theory, logic of discovery, philosophical implications of physical theories.

374. Historical Problems in the Biological Sciences
Fall, Winter. 4(4-0) Juniors or approval of school.
Various themes or periods in the biological sciences. The course may examine the pattern of theoretical development, changes in explanatory ideals, the interaction of external factors and scientific ideas, etc.

375. Historical Problems in the Physical Sciences
Spring. 4(4-0) Juniors or approval of school.
Various themes or periods in the physical sciences. The course may examine the pattern of theoretical development, changes in explanatory ideals, the interaction of external factors and scientific ideas, etc.

376. Historical Problems in Technical Change
Fall, Spring. 4(4-0) Juniors or approval of school.
Factors which influence technical change. Exploration of both historical and contemporary problems of technology and technical change.

377. The Natural Environment: Perceptions and Practices
Spring. 4(4-0) Sophomores.
Factors which have influenced U.S. environmental attitudes as reflected in art and literature, Ways in which changing attitudes have led to changes in legislation and practice.

378. Popular Culture and Technical Change
Winter. 4(4-0) Juniors or approval of school. Interdepartmental with American Studies.
Interrelationships among elements of mass culture and technical change. Introduction to relevant research methods.

483. Philosophy of Physical Science
Fall. 4(4-0) Nine credits in physical science or approval of school. Interdepartmental with the Department of Philosophy.
Philosophical problems of the physical sciences. The topics will be taken from such areas as: quantum mechanics, space-time, classical mechanics, relativity.

484. Philosophy of Biological Sciences
Winter, Spring. 4(4-0) Nine credits in science or approval of school. Interdepartmental with the Department of Philosophy.
Methodological notions and problems of the biological sciences such as: observation and measurement, classification, teleological and functional explanation, teleological systems, emergentism, vitalism, value neutrality.

490. Directed Study
Fall, Winter, Spring. 1 to 6 credits. May reenroll for a maximum of 12 credits. Juniors and approval of school.
Faculty directed studies in curricular areas which are normally related to regular course offerings.
A. Directed Study--General
B. Directed Study--Biology
C. Directed Study--Chemistry/Physics
D. Directed Study--Mathematics
E. Directed Study--Science Studies

491. Senior Seminar I
Fall, Winter, Spring. 3(3-0). Seniors or approval of school.
Selected interdisciplinary problems concerned with the interface between science and society or science and man are identified and formulated. A bibliography is generated and an outline for a thesis prepared.

492. Senior Seminar II
Fall, Winter, Spring. 3(0-3) LBS 491.
The thesis planned in LBS 491 is written and evaluated.

493. Field Experience
Fall, Winter, Spring. 1 to 15 credits. May reenroll for a maximum of 16 credits. Approval of school.
Experiential learning related to the public or private practice of science and technology.
405. Materials and Logistics Policy
Winter, Spring, 4(4-0) MGT 303 plus 12 credits in MGT Program. Interdepartmental with and administered by the Department of Marketing and Transportation Administration. Analysis of comprehensive cases incorporating topical coverage of the entire materials and logistics management program.

409. Business Policy
Fall, Winter, Spring, Summer, 4(4-0) Seniors in Business Administration and MGT 302; AFA 391; MTA 306.

411. Staffing the Organization
Fall, Spring, 4(4-0) MGT 310, MTA 317.

415. Managerial Approaches to Collective Bargaining
Winter, Spring, 4(4-0) MGT 302 or junior nonbusiness majors.

417. Minorities and Women in the World of Work
Fall, Spring, 4(4-0) Senior majors or approval of department. Interdepartmental with the Department of Racial and Ethnic Studies and the School of Social Work. Consideration of current and controversial questions in operations management. Field experience to study operations and policies in business, industry, and government.

419. Group Dynamics and Organization Development
Spring, 4(4-0) MGT 302. Students may not receive credit in both MGT 419 and PSY 356.

Group dynamics and development; organizational diagnosis; assessment of work attitudes and organization climate; organization development goals and methods; action research, survey feedback, team building, conflict management; evaluating organization activities.