

RECOMMENDATIONS TO CAN

SCIENCE CLUSTER I

BIOLOGY MAJORS COURSES

Content Distribution: Biology Courses—

two semesters; many are adding a 3rd semester course
Molecular Genetics

1. Biology Principles, Cell, Respiration, Energy, Mendelian Genetics CAN Bio 2
2. Animal, Physiology Survey CAN Bio 4
3. Plant, Ecology, Evolution CAN Bio 6
4. New Course: Molecular Genetics CAN Bio X

("X" = identify a new CAN number)

CAN Biology Descriptors

CAN Bio 2: Principles of Biology: Cell/Molecular Biology

CAN Bio 4: Principles of Animal Diversity (Zoology)

CAN Bio 6: Principles of Plant Diversity (Botany)

CAN Bio Seq A = CAN Bio 2 + 4 + 6

CAN Bio 10: Human Anatomy

CAN Bio 12: Human Physiology

CAN Bio Seq B = CAN Bio 10 + 12

CAN Bio 14: Principles of Microbiology

[See Discussion below: Additional CAN Biology Courses and changes in content and descriptions are recommended]

Sequence for taking the classes CAN Sequence A [CAN Bio 2, 4 + 6]: there is no common order or sequence for enrolling in Biology courses for the major

- a) Some colleges allow these three courses to be taken in any sequence
- b) Most require CAN Bio 2 first, then the other two in any sequence
- c) Some require the opposite of #b: CAN Bio 4 or 6 first, then CAN Bio 2 as the last course in the sequence

The Chemistry Pre-requisite for CAN Bio 2, 4, and/or 6: Most require Chemistry as a pre-requisite to CAN Bio 2 [commonly known as "Cell and Molecular"], but this varies depending on content alignment for these lower division Biology majors courses at each individual college [mainly where the "Cell and Molecular" are taught, i.e. in the colleges equivalent to CAN Bio 2, 4, or 6].

General Conclusion on Biology CAN Sequence A as currently configured:

- a) The most important transfer and articulation factor for students is to complete the entire sequence before transferring; articulation agreements are very important, but some have not been honored
- b) The challenge for CCs: to convince CSU, but especially UC, that the content covered in CAN Bio Sequence A is "close enough" preparation for success as a Biology major after transfer.

CHEMISTRY PRE-REQUISITE FOR BIOLOGY MAJOR COURSES

- 1 Semester of non-Chemistry major Chemistry course
CAN Chem 6
- 1 Co-requisite of Majors Chemistry course
CAN Chem 2
- 1 Pre-requisite of Majors Chemistry course
CAN Chem 2
- Chemistry Descriptions
CAN Chem 2 = 1st semester for the Science Major
* Required for Bio 2, 4, or 6

CAN Chem 4 = 2nd semester for the Science Major
CAN Chem Sequence A = CAN Chem 2 + 4
** Required for the Biology Majors, but not for CAN Bio A

CAN Chem 6 = 1st semester for Allied Health Majors

CAN Chem 8 = 2nd semester for Allied Health Majors
CAN Chem Sequence B = CAN Chem 6 + 8

CAN Chem 12 = Quantitative Analysis (Most colleges do not offer)
CAN Chem Sequence C = CAN Seq. A + CAN Chem 12

CAN Chem 14 = 1st semester Organic Chem for Science Majors
*** Some colleges that have adopted a three-semester lower division Biology sequence are considering requiring CAN Chem 14 for this “new” third “Cell and Molecular” – CAN Bio X course

CAN Chem 16 = 2nd Semester Organic Chem for Science Majors
*, **, *** are comments from the 1999-2000 and reaffirmed in the 2000-2001 discussions

PHYSICS REQUIREMENT FOR BIOLOGY MAJORS

1. Most require 1 year of Physics w/o Calculus
CAN Phys A
2. Some require 1 semester of Physics + allow 1 additional unit
CAN Phys 2 to be taken after transfer to “make up for content gaps” missed
CAN Phy 2
3. Physics Course Descriptors
CAN Phys 2 = General Physics (Algebra/Trig based) Mechanics, Heat

CAN Phys 4 = General Physics (Algebra/Trig based) Electricity, Optics, Modern Physics
CAN Phys A = CAN Phys 2 + 4

CAN Phys 8 General Physics (Calculus based) for Physical Sci/Engineering majors

CAN Phys 12 General Physics (Calculus based) for Physical Sci/Engineering majors

CAN Phys 14 General Physics (Calculus based) for Physical Sci/Engineering majors
CAN Phys B: CAN Phys 8 +12 + 14

COMMENTS:

1. The physics requirement for Biology majors presents a major problem because of the wide variation among CSU and UC on what math is required for the Physics course and why.
2. The Physics requirement varies from the three-semester, calculus-based Physics to one semester of Physics plus one additional unit to make up for content gaps at the CC.
3. The rationale for requiring Biology majors to take CAN Phys B is to ensure the university that the Pre-Med majors “do well” on the MCAT exam. No comments were put forth on the value of the content for Biology majors.

4. One CC had great difficulty in scheduling physics course sequences due to the polemic of wanting to offer courses required for the major juxtapositioned against administrative concerns for small class size and the cost involved in offering three semesters of low enrollment classes.

Math Requirement for Biology Majors Varies

1. Semester of Calculus
2. A GE Math Course

Statistics Requirement for Biology Majors

1. 2 require statistics
2. 1 has no statistics requirement

There was very little discussion on the math requirements for Biology

Recommended:

1. Add CAN Bio X –Molecular Genetics
2. Develop new CAN Biology Sequences
 - a) Organismic Biology: CAN Sequence A = CAN Bio 2 + 4 + 6
 - b) Allied Health Biology Preparation: CAN Sequence B = CAN Bio 10 + 12
 - c) Molecular Biology: new CAN Molecular Sequence 2 + 4 + 6 + X
 - d) Human Biology: new CAN Sequence 2 + 10 + 12 (Intro + Anatomy [10] + Physiology [12])
 - e) Biotechnology Track: new CAN Sequence 2 + X + 14 (Intro + Molec Gen. + Micro)

Discussion from 1999-2000—Issues in physics are still unresolved; New Can Biology has not occurred, Math requirements vary greatly with no general pattern

CHEMISTRY

Explore the possibility of a revision of the CAN process, that might attract UC's participation in CAN. Revision of the chemistry course descriptors compiled from recommendation 1 above might achieve broader consensus as an articulation vehicle. Further revision of

the CAN process might require each course seeking identification with a CAN number to be subject to examination and certification of course content quality by a faculty review committee containing representatives of all three segments of higher education in California. This quality certification by a faculty committee would carry significant weight in individual articulation agreements. Eventually, as confidence in the CAN process grew, CAN certification might begin to serve as a central articulation review, strongly reducing or possibly replacing the present need for multiple binary agreements. The existence of the IMPAC project and its continued funding may make this a propitious time to initiate these changes, as resources may be available to establish this revision. Such a possible revision of procedure might be shared with CIAC to explore whether UC would be willing to reconsider its participation in CAN if revised.

MATHEMATICS

Convene a CAN discipline review committee to thoroughly review CAN descriptors. Can descriptors for Discrete Mathematics and for Mathematical Proofs need to be created. Our review indicates that while the major courses are in pretty good shape there is much disagreement in the descriptors for the service courses such as the General Education courses for non-quantitative majors, the math for elementary teachers, and statistics. While we started this review at our statewide meeting it was clear that the participants didn't feel empowered to propose these descriptors. Participants for this review committee should be empowered by their institutions to propose changes. The process then should continue with a wide dissemination of the proposed changes with feedback solicited.

PHYSICS

Advise the CAN Board of the discussions in the field concerning the modules proposal. The faculty group discussion resulted in the following set of draft "course modules." Listed for each module are the major subtopics/concepts. The proposal on the next page will need discussion in a wider group of physics faculty.

Module 1: MECHANICS

- ♦ Vectors and Scalars
- ♦ Newton's Laws
- ♦ Statistics
- ♦ Linear Kinematics and Dynamics
- ♦ Rotational Kinematics and Dynamics
- ♦ Conservation Laws
- ♦ Gravitation

Module 2: MECHANICAL WAVES & OSCILLATIONS

- ♦ Waves on a string
- ♦ Standing Waves
- ♦ Interference
- ♦ Resonance
- ♦ Superposition
- ♦ Sound
- ♦ Doppler Effect

Module 3: SIMPLE HARMONIC MOTION

Module 4: THERMAL PHYSICS

- ♦ Calorimetry
- ♦ Heat Transfer
- ♦ Kinetic Theory
- ♦ Thermodynamics

Module 5: FLUIDS

- ♦ Density
- ♦ Hydrostatics
- ♦ Archimedes Principle
- ♦ Pascal's Principle
- ♦ Hydrodynamics
- ♦ Bernoulli's Principle

Module 6: ELECTROSTATICS & DC CIRCUITS

- ♦ Charge
- ♦ Coulomb's Law
- ♦ Fields
- ♦ Potentials
- ♦ Gauss's Law
- ♦ Voltage, Current, Resistance
- ♦ Capacitance
- ♦ Kirchoff's Rules
- ♦ Flux
- ♦ EMF (?)

Module 7: MAGNETISM, AC CIRCUITS & MAXWELL'S EQUATIONS

- ♦ Faraday's Law
- ♦ Ampere's Law
- ♦ Biot-Savart Law
- ♦ Magnetic Fields
- ♦ RC,RL,RLC Circuits
- ♦ Phasors
- ♦ Inductance
- ♦ Lenz's Law
- ♦ Flux(?)

Module 8: E&M WAVES

- ♦ Speed of Light
- ♦ Color, Frequency
- ♦ Momentum and Energy of E&M Waves

Module 9: GEOMETRIC OPTICS

- ♦ Reflection
- ♦ Refraction
- ♦ Ray Tracing
- ♦ Lenses
- ♦ Mirrors
- ♦ Optical Instruments

Module 10: PHYSICAL OPTICS

- ♦ Interference
- ♦ Diffraction
- ♦ Polarization
- ♦ Dispersion
- ♦ Resolution
- ♦ Phase

Module 11: SPECIAL RELATIVITY

Module 12: QUANTUM MECHANICS

- ♦ Experimental Basis of Quantum Mechanics
- ♦ Particle-Wave Duality
- ♦ Wave Functions
- ♦ Atoms and Molecules
- ♦ Applications of Schrodinger's Equation
- ♦ Topics from Solid State, Nuclear & Particle Physics

SCIENCE CLUSTER II

AGRICULTURE

REVIEW THE FOLLOWING CAN DESCRIPTORS:

CAN: AG 2

TITLE: Ag Computers

DESCRIPTION: Applied microcomputing for agribusiness management. Evaluation of alternative microcomputing systems and software. Use of word processing, spreadsheet, and database management programs; applications to agricultural enterprise management and agricultural financial planning.

CAN: AG 4

TITLE: Basic Ag Mechanics

DESCRIPTION: Description not available.

CAN: AG 6

TITLE: Introduction to Animal Science

DESCRIPTION: A scientific overview of livestock and poultry; highlights anatomy and physiology, reproduction, nutrition, behavior, health, and marketing; pertinent environmental and social issues, to include animal welfare. Includes human opportunity to influence trait inheritance, population densities, and productivity. Laboratory recommended

CAN: AG 8

TITLE: Introduction to Plant Science

DESCRIPTION: Introduction to and application of principles of plant science to production of cultivated crops; including how yield and quality are affected by breeding, propagation, culture, harvesting, storage, and marketing. Laboratory required.

CAN: AG 10

TITLE: Plant Propagation

DESCRIPTION: Principles and methods of propagating plants, sexual and asexual: field crops, fruits, vegetables, ornamentals, seeds, spores, cuttings, layering, grafting and budding. Propagation media and rooting aids. Laboratory required.

CAN: AG 12

TITLE: Feed and Feeding

DESCRIPTION: Composition and selection of feeds; characteristics of nutrients; principles of nutrition; nutrient requirements of non-ruminant and ruminant animals; and formulating diets to meet these requirements.

CAN: AG 14

TITLE: Introduction to Soil Science

DESCRIPTION: Biological, chemical, physical and mineralogical soil properties. Interpretation of soils information for agricultural management and production. Proper land use and conservation; soil and water management. Laboratory required.

CAN: AG 18

TITLE: Ornamental Plant Identification

DESCRIPTION: Classification, nomenclature, and identification of common trees, vines, shrubs, ground covers, turf grasses, bedding plants, and house plants. Characteristics of important plant families are discussed. Laboratory required.

CAN: AG 20

TITLE: Introduction to Beef Cattle Science

DESCRIPTION: A study of the beef cattle industry emphasizing the importance of breeds, selection, evaluation, nutrition, breeding principles, disease control, equipment, facilities, and marketing. Laboratory recommended.

CAN: AG 22

TITLE: Introduction to Sheep Science

DESCRIPTION: A study of the sheep industry emphasizing the importance of breeds, selection, evaluation, nutrition, breeding principles, disease control, equipment, facilities, and marketing. Laboratory recommended.

CAN: AG 24

TITLE: Introduction to Swine Science

DESCRIPTION: A study of the swine industry emphasizing the importance of breeds, selection, evaluation, nutrition, breeding principles, disease control, equipment, facilities, and marketing. Laboratory recommended.

CAN: AG 26

TITLE: Introduction to Equine Science

DESCRIPTION: A study of the horse industry emphasizing the importance of breeds, selection, evaluation, nutrition, breeding principles, disease control, equipment, facilities, and marketing. Laboratory recommended.

CAN: AG 28

TITLE: Introduction to Dairy Science

DESCRIPTION: Description not available.

FOOD SCIENCE AND NUTRITION

The following two courses should be added to the CAN list in Family and Consumer Science.

1. SANITATION AND SAFETY

Basic principles of personal and institutional sanitation and application of these principles to food preparation, storage, service; prevention of food contamination. Regulations of the California Health and Safety Code. Emphasis on the supervisor's responsibilities in maintaining high standards of these principles. Training to meet certification requirements for food handlers.

Core components: Importance of sanitation; microorganisms; contamination; foodborne illness and food allergies; food storage and handling; personal sanitation; HACCP principles, sanitary facilities and equipment; sanitation regulations; accident prevention; crisis management; and pest management.

CSUs that have a similar class include: Cal Poly Pomona, CSU Long Beach, CSU Los Angeles, Cal Poly San Louis Obispo.

2. INTRODUCTION TO THE PROFESSIONS

Orientation to careers in Dietetics, Nutrition Science, Food Science and Food Service Management. Introduction to professional associations, publications and legislation pertinent to the professions discussed. Core components: Professional Associations, professional ethics, publications, legislation, employability, career goals, career preparation, evolving career opportunities (Speakers in professional areas and from local university programs as well as field trips may be included)

CSUs which have a similar class are: CSU San Bernardino, Cal Poly Pomona, CSU San Diego, San Jose State and CSU Long Beach.

The following two course descriptions should be updated:

FCS 26 Food Science Technologies: add "Chemistry of foods" after "exploration" of in the first line as indicated below.

Exploration of **chemistry of foods**, food processing and technology and how it affects the color, flavor, texture, aroma and quality of foods. Core components remain the same.

FCS 28 Cultural and Ethnic Foods. Modify descriptor as indicated below.

Regional, ethnic, cultural, religious, historical and social influences on food patterns and cuisines.

Core components: Specialized equipment and utensils **related to cultures**; regional, ethnic, cultural, religious, historical and social influences; traditional foods of selected cultures; geographic factors in food availability; global food issues; sanitation and safety practices; application to the food industry.