SIMON FRASER UNIVERSITY
MEMORANDUM

S.79-15

To.........H.M..Evans,.Secretary...................	From...N..Heath,.Assistant..to..the.............
.........Senate.......................................	...Dean..of..Science...........................
Subject.....Report.on.Special.Topic.Courses.......	Date...1978-12-19.................................

Details of the selected topics courses offered in the Faculty of Science in the semesters 77-3, 78-1, 78-2 and 78-3 are attached for the information of Senate. The courses included are:

77-3	Biological Sciences	471	Experimental Aquatic Biology
		472	Advanced Developmental Biology
		473	The Echinoderms
	Mathematics	495	Non Parametric Statistics
	Physics	198	Introductory Astronomy
78-1	Biochemistry	420	Contemporary Biochemistry
	Biological Sciences	471	Introduction to Mammalogy
		472	Anatomy, Biology and Taxonomy of the Araneae of Canada
		473	Physical and Chemical Aspects of the Terrestrial Environment
	Mathematics	291	Mathematical Model Building
		292	Principles of Mathematics for Teachers II
		496	Experimental Design
78-2	Biological Sciences	471	Limnology
78-3	Biological Sciences	471	Ornithology
		471	Biology of fishes
		472	Toxicology
		472	Environmental Physiology
		473	Experimental Ecology of Benthic Marine Algae

78-3	Chemistry	472	Theoretical Chemistry
	Mathematics	292	Introduction to Actuarial Mathematics
	Physics	493	Nonlinear Problems in the Physical World
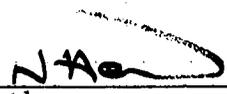
N. Heath

NH:km
Attach.

Department of Biological Sciences

Course Outline

Fall 1977 (at Kelowna)   BiSc. **471-3**

(2 - 0 - 4)   Dr. L.D. Druehl

Special Topics in Biology: Experimental Aquatic Biology

       Prerequisites: BiSc. 204 (or Okanagan Coll., BiSc. 222).
                   Recommended BiSc. 326 be taken concurrently.

Theories and techniques for the evaluation of aquatic biological
processes will be explored. Emphasis will be on local waters.
One field trip to the Bamfield Marine Station is planned. Each
student will conduct a research project.

Enrollment: 4

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Department of Biological Sciences

Course Outline

Fall 1977   BiSc. 472-3

(2 - 2 - 0)   Drs. Baillie & Smith

Special Topics in Biology: ADVANCED DEVELOPMENTAL BIOLOGY

     Prerequisites: BiSc. 201, 202 and 203. BiSc. 301 recommended.

    This course is designed to bring the advanced undergraduate
student up to date in modern studies of developmental biology.
The lectures are concerned with major topic areas such as
cytoplasmic localization phenomena, maternal versus embryonic
transcriptional events, nuclear totipotency, etc. The lectures
cover the classical experiments in these areas followed by an in
depth examination of recent experiments at the molecular and
biochemical level. The student is expected to be well grounded
in basic embryology, biochemistry, and cell biology in preparation
for this course.

    Course texts: Molecular Biology of Eucaryotic Cells by Hood,
                 Wilson & Wood.

Enrollment: 4

Department of Biological Sciences

Course Outline

Fall 1977

BiSc. 473-3

(0 - 0 - 9)

Dr. P.V. Fankboner

Special Topics in Biology: The Echinoderms

Prerequisites: BiSc. 306

Objective of the course: Further study and training by advanced
students of invertebrate zoology on the microanatomy, ecology and
taxonomy of echinoderms living in coastal waters of British
Columbia.

Course Text: Starfishes and their relations by Clark.

Enrollment: 14

Selected Topics in Mathematics

MATH 495-4

Title:

Instructor: Dr. P. De Jong

Vector: 4-1-0

Enrolment: 10

NON PARAMETRIC STATISTICS

Recommended Text:

    <u>Practical Nonparametric Statistics</u> by W.J. Conover,
    John Wiley & Sons Inc., New York, London, Sydney,
    Toronto

PHYSICS 198-3

TITLE: I N T R O D U C T O R Y ___ A S T R O N O M Y

FALL SEMESTER 1977

INSTRUCTOR: *Leigh Hunt Palmer*

TEXTBOOK: *Exploration of the Universe, Third Edition, by George O. Abell*

TIME & PLACE: *7:30 - 9:30 p.m. Monday and Wednesday, Room 9002*

Introductory Astronomy will be a quantitative survey of the subject with mathematical treatment at the level of simple algebra. Lectures will be supplemented with planetarium sessions and optical observation sessions. Relevant physics from the areas of optics, mechanics, relativity and nuclear physics will be included. The astronomical topics will be selected from among those in the textbook and will include the motions of the earth, moon, sun, planets, and stars, methods and instruments of observational astronomy, stellar and galactic evolution, and cosmogony.

Questions regarding the course should be directed to Leigh Palmer at 291-4844.

Vector: 3-1-0

Prerequisites: B.C. High School Physics 11 and Math 12 or equivalent

Enrolment: 46

SIMON FRASER UNIVERSITY
MEMORANDUM

To...... N. Heath
Administrative Assistant

From...... A.M. Unrau

Subject...... BIOCHEMISTRY 420-3
1978 - Spring Semester

Date...... 18 December, 1978

"Selected Topics in Contemporary Biochemistry"

<u>Topic</u>

Physical and Biochemical Properties of Model and Cell Membranes

1. Historical and modern concepts of membrane structure. Electron micro-scopic examination of membrane structure. Chemical composition of biomembranes;

2. Comparison of synthetic model monolayer and bilayer vesicles with bio-membranes;

3. Studies of physical properties of membranes; i.e., fluidity of structure:
   (a) E.S.R. - mobility of polar head-groups and mobility along hydrocarbon chain of fatty acid;
   (b) N.M.R. - Deuterium label, relaxation phenomena, etc.

4. Transport properties, theories of active transport;

5. Macrolide antibiotic effect on membrane structure;

6. Correlation of antibiotic resistance with sterol biosynthesis pathways.

AMU

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Instructor : A.M. Unrau

Vector: 3-0-0

Enrolment: 4

Prerequisite: Permission of the Biochemistry Curriculum Committee.
              Upper levels standing (with at least 60 semester hours)
              in the Biochemistry Program will usually be required.

Department of Biological Sciences

Course Outline

Spring 1978 (at Kelowna)   BiSc. 471-3

                                                 Dr. R.M. Sadleir

Special Topics in Biology: Introduction to Mammalogy

        Prerequisites: Permission of the Department.

        A review of the biology of mammals with special emphasis on the
        larger game species of British Columbia and on marine mammals.

   Course Texts: Mammalogy by Vaughan
                   Mammalogy by Gunderson
                   Mammalian Odours & Pheromones by Stoddart
                   The Mammals of B.C. by Cowan & Guiget

Enrollment: 6

Spring 1978 (at Kelowna)   BiSc. 472-3

(2-0-3)   Dr. Turnbull

Special Topics in Biology: Anatomy, Biology and Taxonomy of the Araneae of
                             Canada

    Pre-requisites: Permission of the Department.

    Canadian Spiders (Araneae): A review of the biology, anatomy,
and taxonomy of spiders with emphasis on the common spiders of
Canada.

Enrollments: 6

Department of Biological Sciences

Course Outline

Spring 1978

BiSc. 473-3

(2 - 0 - 4)

Drs. Brooke/Lister

Special Topics in Biology: Physical and Chemical Aspects of the
Terrestrial Environment

Prerequisites: 75 semester hours credit in the biological
sciences program.

Students who have credit for BISC 300 may
not take this for further credit.

The physical and chemical aspects of terrestrial environment
as related to biological systems; large and small-scale
environmental processes, energy balances and fluxes;
measurement and evaluation.

Enrollments: 17

Selected Topics in Mathematics

TITLE: **MATHEMATICAL MODEL BUILDING**

EVENING COURSE

291-2

SPRING 78

INSTRUCTOR: Dr. M. Singh
VECTOR: 2-1-0
ENROLMENT: 11

An introductory course in applications of the calculus in business, commerce, and engineering problems. The course includes: approximation techniques and mathematical modelling applied to problems in ecology, population dynamics, business management, and related areas; Mathematics of finance: finite difference methods and their applications in actuarial science.

The emphasis will be to inquire into practical and realistic problems. Making appropriate approximations, mathematical models will be constructed, and then the subsequent comparison of theoretical results with available data shall be made.

PREREQUISITE: MATH 152-3 or 155-3

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78-1   Title: PRINCIPLES OF MATHEMATICS FOR TEACHERS II

Instructor: Dr. H. Gerber   Enrolment: 28

                                                    Vector: 3-1-0

1. Integers, Rationals and Reals

      a. Integers and rationals

      b. Multiplication and division of integers and rationals

      c. Using integers as exponents

      d. Irrationals and reals

      e. Approximations and rational exponents

2. Logic and set theory

      a. Venn Diagrams, complements and intersection

      b. Logical connectives

3. Informal Geometry and Measurement

      a. Points, lines and planes

      b. Angles and separation

      c. Simple closed curves

      d. Motion Geometry - flips or reflections

      e. Translations, rotations and congruence of triangles

      f. Measurement - Metric system

      g. Perimeters, areas and volumes

      h. Functions, relations and graphs

      i. The straight line and the circle

4. Computing

      a. Hand calculators

      b. Flow charts

PREREQUISITE: MATH 190-3

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Selected Topics in Mathematics

MATH 496-4

Title: EXPERIMENTAL DESIGN

Spring 78

Instructor: Dr. P. De Jong
Vector: 4-1-0
Enrolment: 10

1. Brief review of:

(a) Distribution of random variables, expected values.

(b) Sampling from $N(\mu, \sigma^2)$ with the generation of chi-squares, F and t distribution.

(c) Two parameter tests with explanation of $H_0 : \mu_1 = \mu_2$ test by t or F, and generalization to one-way ANOVA.

(d) Review of Power and required sample size.

2. Analysis of variance

(a) One-way analysis (one factor)

(b) Two or more factors

(c) Fixed, random and nested models

(d) Tuckey's and Scheffé's tests

3. Analysis of covariance

4. Multiple regression

5. Factorial Experiments

(a) 2^n models

(b) Latin squares and Greco-Latin squares

(c) Conformity

(d) Fractional designs

(e) Incomplete block designs

(f) Response surfaces

PREREQUISITES: Math 302 or Math 371. Permission will be given to students from other departments with suitable backgrounds.

RECOMMENDED TEXT: Fundamental Concepts in the Design of Experiments by Hicks

REFERENCE TEXT: Introduction to Linear Models and the Design and Analysis of Experiments by William Mendenhall

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Department of Biological Sciences

Course Outline

Intersession - BISC 471-3

Summer 1978   Dr. G.H. Geen

Special Topics in Biology: Limnology

    Prerequisites: One of BISC 300, 306 or 424 recommended.

    This course will involve a consideration of fresh waters with
    particular reference to those in British Columbia.   The origin
    of lakes and streams and the physical and chemical parameters of
    particular importance to plant and animal life will be considered.
    Much of the emphasis in the lectures, laboratories and field work
    will focus on the biology of fresh water organisms.

    Recommended Text: Limnology by R.G. Wetzel

Enrollment: 5

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Department of Biological Sciences

Course Outline

Fall 1978   BiSc. 471 (Group 01)

(2 - 0 - 4)   Dr. N. Verbeek

Special Topics in Biology: Ornithology

     Prerequisite: BiSc. 304 or BiSc. 316.

     To provide advanced undergraduate students with an understanding
of the biology of birds. This will be achieved through a series
of lectures on a wide range of topics. Laboratories will emphasize
classification, identification, and morphology of North American
birds, behaviour, and ecology. Field trips will provide practical
experience in field identification, behaviour studies and ecology
of birds.

Course texts: Families of Birds by O.L. Austin
               The Life of Birds by J.C. Welty
               Birds of North America by Robbins et al

Enrollment: 14

Fall 1978 (At Bamfield) The Biology of Fishes BiSc. 471

(3 - 0 - 4) Dr. K. J. Brewer

Three one hour lectures will be given each week. Topics to be covered:

1. Evolutionary history and classification of the main fish groups.

2. The circulatory system - anatomy and physiology.

3. Structure and function of the gills and air bladder.

4. Reproduction and development.

5. Ecology and Zoogeography.

Laboratory Work - four hours per week

This will be divided into two sections:-

A. Fish will be collected from a variety of marine habitats (eel grass, kelp beds etc.) and classified in the laboratory.

B. Coho salmon (Oncorhynchus kisutch) will be maintained in the laboratory and subjected to a variety of experimental treatments eg. increasing or decreasing photoperiods, differing salinities and temperatures, so as to determine optimum conditions for growth. Treatment with hormones may also be carried out. Results from this investigation will be presented as a scientific paper.

If time allows, a visit to salmon spawning beds will also be carried out.

ALLOCATION OF MARKS

1. Final exam   40%
2. Mid-term exam   35%
3. Coho paper   25%

TEXTS

1. Pacific Fishes of Canada - J.L. Hart. F.R.B. of C. 1973.
2. Ichthyology - K.F. Lagler et al. 1977.

Enrollment: 13

Department of Biological Sciences

Course Outline

Fall 1978

(2 - 1 - 0)

BiSc. 472 (Group 01)

Dr. C. van Netten

Special Topics in Biology: Selected Topics in Toxicology

Prerequisite: BiSc. 201 or permission of the Department.

This course will investigate the available information regarding
the modern chemical environment and its effect on living organisms.
Topics dealt with will include heavy metals, pesticides, PCBs,
food additives, synthetic hormones, and drugs.   Special attention
will be given to the physiological and biochemical principles
involved and their relationship to cancer.

Enrollment: 46

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Department of Biological Sciences

Course Outline

Fall 1978 (at Bamfield)   Environmental Physiology   BiSc. 472

(3 - 0 - 4)   Dr. K. Brewer

Three one hour lectures will be given each week.   Topics to be covered:

1.   Diving in vertebrates - whales, seals, otters, amphibians and reptiles.

2.   Animal rhythms. Photoperiodism.

3.   Life at high altitudes.

4.   Thermal relations - endothermy and ectothermy. Life in hot and cold
     environments. Hibernation.

5.   Regulation of salt and water levels in vertebrates and invertebrates.
     Life in hypo-and hyperosmotic environments.

Laboratory work - Four hours per week.

     The theme of the course will be osmo - and ionoregulation in different
     animal groups. Two projects from the following will be carried out
     and results presented as scientific papers.

1.   Ion levels and osmotic pressure will be monitored in a variety of
     experimental situations in an invertebrate species. Depending on
     availability, annelids, crustaceans or molluscs will be used.

2.   The ability of euryhaline and stenohaline fish species to withstand
     charges in the ambient medium. If possible, beach fish will be
     collected at various times after the tide has receded and plasma
     samples analysed for various ions. Oxygen concentrations and water
     temperatures in tidal pools will be recorded.

3.   The marine green turtle, Chelonia mydas, has modified orbital glands
     which function to rid the body of excess salt. A study of the role
     played by the salt gland and the kidney/cloacal complex in Na^+ and K^+
     homeostasis will be carried out.

ALLOCATION OF MARKS

1.   Final exam   - 40%
2.   Mid-term exam   - 30%
3.   Project   - 30%

TEXTS - Comparative Physiology of Animals - an environmental approach.
        R.W. Hill.

Enrollment: 13

DEPARTMENT OF BIOLOGICAL SCIENCES

Course Outline

Semester: 78-3

Vector: 3-0-4

BISC. 473-3, Special Topics:

Prof. Dr. L. Druehl

Experimental Ecology of Benthic Marine Algae

Lectures, Readings and Laboratory exercises dealing with various biological functions of seaweed particularly as they relate to ecology.

Text: Selected reprints

Evaluation technique:

2 Papers and an examination.

Enrollment: 18

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CHEM 472-3   Selected Topics in Theoretical Chemistry

<u>Course Outline for Chem 472 Fall 1978</u>

Prof. G. Malli

<u>Texts</u>: (i) F.A. Cotton: Chemical Applications of Group Theory. Wiley
Interscience Second Edition 1971.

(ii) I.G. Kaplan: Symmetry of Many-Electron Systems: Academic Press 1975.

<u>Course Contents</u>: 1. Groups: Subgroups, Classes,   . Some examples of groups. .

2. Molecular Symmetry and Symmetry groups: Finite groups,
classification of molecular symmetry groups. Proper axes
and rotations. Improper axes and rotations. Symmetry point
groups.

3. Group Representations - Matrix Representation of Groups:
Character, Irreducible representations, Group representations

4. Group Theory and Quantum Mechanics: Wavefunctions as bases
for (IR's). Direct Product. Symmetry adopted Linear
Combinations (SALC). Projection operators. ····

5. Application of Group Theory: Molecular orbital theoretical
methods and group theory. LCAO/MO/ISCF - Scheme of
Roothaan, CI. Hybrid orbitals, Ligand Field Theory
Molecular Vibrations. Selections Rules. .

Instructor: Dr. G. Malli

Vector: 3-1-0

Prerequisite: CHEM 361-3

Enrolment: 1

Selected Topics in Mathematics

MATH 292-3

FALL 78

Title: INTRODUCTION TO ACTUARIAL MATHEMATICS   Vector: 3-1-0

(Evening)

Instructor: Mr. R. Norman   Enrolment: 7

An introduction to the theory of interest, life insurance and pensions. Topics to be covered include mortgages, annuities, life insurance, registered retirement savings plans and the funding of pension plans.

1. Introduction - what is an actuary?
                - where do actuaries work?
                - training of actuaries.

2. Compound Interest
                - accumulation with interest: $(1 + i)^n$
                - discounting: v^n , the present value
                - annuity certain $a_{\overline{n}|}$
                - accumulation $s_{\overline{n}|}$
                - payment in advance, and more frequently than annual $\ddot{a}^{(12)}$, $\overline{a}$
                - use of compound interest tables
                - finding effective rate of interest

3. Payment schedules (loans, mortgages, etc.)
                - equivalence of two sets of payments
                - relationship between $a_{\overline{n}|}$ and $a_{\overline{n-1}|}$
                - repayment of loans
                - mortgage schedules

4. Life annuities
                - life tables. l_x, d_x, p_x, q_x
                - expectation of life t_x, $\overset{o}{e}_x$
                - present value of life annuity; definition of D_x, N_x
                - $\ddot{a}_x = N_x/D_x$, other modes of payment
                - guaranteed annuities, use of tables
                - relationship between a_x and a_{x+1}: the reserve

5. Life insurance
                - value of whole-life insurance, definition of M_x, $A_x = M_x/D_x$
                - $A_x = 1 - \ddot{a}_x$; net premiums for whole life assurance, endowment, term assurance

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5. Life insurance - cont'd

      - office premiums for insurances and annuities

      - policy reserves (no expenses) for whole life, endowment, term, annuities

      - loans against policies, surrender values, paid up policies

6. Pensions   - types of pension plans, final earnings, money purchase, career average, fixed benefit.

      - funding of pension plans (e.g. Canada Pension Plan, Registered Retirement Savings Plans, etc.)

Additional topics, as time permits.

7. Accounts and Investments.

      - development of balance sheet and income and expenditure

      - accounts, from a common sense point of view.

      - equity and fixed interest capital, the stock exchange, book values and market values.

      - valuation of investments for actuarial purposes.

8. The Actuarial Valuation.

      - types of valuation (i.e. reason for valuation)

      - the valuation basis

      - valuation of life insurance companies - solvency and distribution of surplus.

      - valuation of pension funds - solvency and funding.

Prerequisites: (1) Math 101 (with a grade of A or B) and one of Math 151, 154, or Math 157

      or (2) Math 371

      or (3) (with permission of the Department) equivalent experience.

Special Topics in Physics

PHYSICS 493-3

R.H. Enns, Instructor

"Nonlinear Problems in the Physical World"

Text: Chapter 10 of "An Introduction to

the Methods and Tools of Theoretical

Physics" by R.H. Enns and

S.S. Rangnekar (a text in preparation).

Outline attached.

Vector: 3-0-0

Prerequisite: Permission of the Department

Enrolment: 7

Chapter 10 - Nonlinear Problems in the Physical World

10.1   Introduction (pp 1-3).

10.2   Some Interesting Nonlinear Systems (pp 3-36).

    A. Nonlinear Mechanics
      (Simple pendulum, Jacobian elliptic functions, the
      eardrum, nonlinear damping.)

    B. Competition Phenomena
      (Volterra competition equations (big fish-little fish,
      rabbits-foxes, etc.), Eigen's theory of selection and
      evolution of biological molecules, interacting laser
      beams, arms race between nations.)

    C. Nonlinear Electrical Phenomena
      (Nonlinear inductance, electronic oscillator circuit
      (Rayleigh equation, Van der Pol equation).)

    D. Solitons
      (Water waves and the KdV equation, the Sine-Gordon
      equation, self-induced transparency.)

10.3   Methods of Solution (pp 37-72).

    A. Exactly Soluble Equations:

      i)   Equations whose variables can be separated.
      ii) The Bernoulli Equation.
           (Laser beam problem, nonlinear diode.)
      iii) The Riccati Equation.
           (Competition between two species.)
      iv) Equations of the structure $d^2y/dx^2 = f(y)$.
           (Simple pendulum, elliptic integrals, elliptic
           functions, phase plane diagram for pendulum.)

    B. Variation of Parameters.

      (Nonlinear damping, introduction to Krylov-Bugoliubov
      method.)

10.4   Topological Analysis and Graphical Solutions (pp 73-138).

    A. Topological Analysis
      (Phase plane diagram, types of singular points (vortex,
      saddle point, focal point, nodal point), criteria for
      classification of singular points, stability criteria,
      higher order singularities, Poincaré's theorem for the
      vortex and applications.)

    B. Graphical Methods of Solution
      1) The Isocline Method
         (Solution of Van der Pol equation, introduction to
         limit cycles.)
      2) The Delta (δ) Method
         (Nonlinear spring, Rayleigh equation, relaxation
         oscillations.)