S.03-104

As amended by Senate 3 Nov 03

SIMON FRASER UNIVERSITY

Senate Committee on University Priorities
Memorandum

TO: Senate

FROM: John Waterhouse
Chair, SCUP
Vice President, Academic

RE: Graduate Diploma in Bioinformatics

DATE: October 14, 2003

Attached is a proposal from the Faculties of Science and Applied Sciences and the Department of Molecular Biology and Biochemistry and the School of Computing Science for a Graduate Diploma in Bioinformatics.

The Senate Committee on University Priorities reviewed the proposal at its October 8, 2003 meeting. With minor edits which have now been incorporated into the document, the proposal was unanimously approved.

Once approved by Senate, the proposal is to be submitted to the Board of Governors.

MOTION:

"That Senate approves and recommends to the Board of Governors the proposal for a Graduate Diploma in Bioinformatics as outlined in S.03-104 including new courses MBB 505, 506, ~~601~~ 611, ~~602~~ 612, ~~603~~ 613, 659, 669, 679.

encl.

c: M. Plischke, Acting Dean, Faculty of Science
B. Lewis, Dean, Faculty of Applied Sciences
J. Driver, Dean, Graduate Studies
B. Brandhorst, Chair, Dept. of MBB
M. Smith, Dept. of MBB
A. Gupta, School of Computing Science

PROPOSAL
FOR
GRADUATE DIPLOMA
IN
BIOINFORMATICS

Prepared by:

Dr. Michael J. Smith, Professor and Chair, Dept. Mol. Biol. & Biochem.
Dr. Arvind Gupta, Professor of Computing Science & Scientific Director of MITACS

Revised October 10, 2003

The Department of Molecular Biology and Biochemistry in the Faculty of Science and the School of Computing Science in the Faculty of Applied Science jointly propose a Graduate Diploma in Bioinformatics. This program will serve the needs of the scientific and business communities as well as support students sponsored by the CIHR Bioinformatics in Health Science Training Grant in which SFU is a full partner with the University of British Columbia and the BC Genome Sciences Centre.

Bioinformatics emerged as a necessary support discipline for the emerging international genomics and proteomics initiatives that have resulted in almost overwhelming amounts of data. The full use of the genomics and proteomics databases requires specific skill sets that combine both computational (computer) and life sciences background. The immediate need for personnel trained in the area of bioinformatics is outlined in a number of sources including the white paper *"Bioinformatics Curriculum Recommendations for Undergraduate, Graduate and Professional Programs"* prepared by the Canadian Genetic Diseases Network and the NIH report of *"The Biomedical Information Science and Technology Initiative: June 3, 1999"* (http://www.nih/gov/about/director/060399.htm.

There is an open and expanding demand for personnel skilled in bioinformatics. Market research reports estimate that in the U.S. alone the bioinformatics market at US$2 to 5 billion by 2005. Genome Canada is projecting needs for up to 262 bioinformaticians by 2005. 77 researchers associated with the Canadian Genetic Diseases Network have forecast a need for 1083 bioinformatics positions by 2006. The hi-tech business market clearly provides an even greater demand for skilled bioinformaticians. Undergraduate programs in bioinformatics are emerging across Canada (14 named programs to date, UBC has a course in preparation, and the MBB and the School of Computing Sciences at SFU are proposing a joint major in computing science and molecular biology). We maintain that the undergraduate programs will start to produce an increasing number of entry level bioinformaticians, but that our proposed graduate diploma can address not only immediate needs, but will serve a large constituency of more mature life and computational scientists that will provide a sustained base for this program.

GRADUATE DIPLOMA IN BIOINFORMATICS:

This program is designed to provide advanced education in the area of bioinformatics for students with a bachelor's degree in molecular biology, cell biology, biochemistry, computer science, mathematics, or related disciplines. The program is open to students that have been accepted into the CIHR Training Program in Bioinformatics for the Health Sciences (CTPB). Students external to the CTPB will be accepted on a competitive basis if slots are available. The selection process will include a screening of applicants by a subcommittee composed of representatives from MBB and Computing Science. Students will be required to register in either Computing Science or MBB. ***Applicants who do not have adequate preparation in the fundamentals of life science or computer science will be directed to courses that will bring them up to date (e.g., CMPT307, CMPT354, MBB 331).***

The program consists of core and elective course work plus a minimum two semesters in the practicum courses. The practicum courses are rotations through two participating bioinformatics research groups wherein the student will be assigned an original research project in bioinformatics. The objective of the practicum is to give the student immediate hands-on experience with a real research problem that will augment their more formal education in the core and elective courses. Practicum projects will be solicited from a large panel of active research groups engaged with bioinformatics. The student will have a supervisory/advisory committee consisting of a senior mentor and two other participating faculty members. This panel of 'mentors' is drawn from the faculty of SFU, UBC, and the BC Genome Sciences Centre (see appended lists). The student in consultation with his/her mentors will be assigned to practicums based on the student's needs, area of interest, and background. The results of the practicum semester must be written in journal form that will be the subject of an oral presentation. The practicum mentor plus two other faculty members will grade both the oral presentation and written report.

There is a minimum of 33 units required (21 course work units and 12 units in 2 practicum lab rotations). Students must obtain a B or better in each class or Practicum. Students registered in this program

who are not part of the CIHR program are strongly encouraged to choose their courses from those offered at SFU.

REQUIRED COURSES: (4 LECTURE FOR 12 UNITS; 2 PRACTICUM FOR 12 UNITS)

1) MBB 441/841	(3)	Bioinformatics	SFU
2) CMPT 341/881	(3)	Computational Molecular Biology	SFU
3) MBB/CMPT 505	(3)	Prob. Based Learn. In Bioinform.	SFU, BCCA, CMMT
4) MBB/CMPT 506	(3)	Critical Research Analysis	SFU, UBC

5) At least two of

Number	Units	Title	Location
MBB/CMPT 601	(6)	Research Rotation 1	SFU, UBC, BCCA
MBB/CMPT 602	(6)	Research Rotation 2	SFU, UBC, BCCA
MBB/CMPT 603	(6)	Research Rotation 3	SFU, UBC, BCCA

5) ELECTIVES: 3 courses chosen from: (3 FOR 9 UNITS)

MBB 435/835[1]	(3)	Genomic Analysis	SFU
MEDG 505[1]	(3)	Genome Analysis	UBC
MBB 442/842	(3)	Proteomics	SFU
MBB 659[2]	(3)	Special Topics in Bioinformatics	SFU
MBB 669	(3)	Special Topics in Genomics	SFU
MBB 679	(3)	Special Topics in Proteomics	SFU
MBB 831	(3)	Molec. Evol. Euk. Genomes	SFU
MBB 832	(3)	Molec. Phylog. Evol.	SFU
CMPT 740[5]	(3)	Database Systems	SFU
CPSC 536A	(3)	Topics in Algorithms and Complexity-Bioinform.	UBC
CPSC 504[5]	(3)	Advanced Database Design and Data Mining	UBC
CPSC 304[4]	(3)	Database Management and Design	UBC
CMPT 354[4]	(3)	Database Systems I	SFU
MBB 331[4]	(3)	Molecular Biology	SFU
CMPT 770	(3)	Computer Graphics	SFU
CMPT 878	(3)	Scientific Visualization	SFU
STAT 547		Statistical Problems Arising in Genomics	UBC
STAT 890[3]	(4)	Statistical Inference from human genetic data	SFU

[1] Credit will be given for only one of MBB 435 or MEDG 505.
[2] Special topics courses are given upon student demand and instructor availability
[3] STAT 890 is a Special Topics course number; course content will vary by offering. See the appended list of courses.
[4] CPSC 304, CMPT 354, and MBB 331 will not count toward Elective requirements; they will be recommended if the student is deficient in either computational or life sciences background.
[5] Credit will be given for only one of CMPT 740 and CPSC 504.

SEMESTER I	SEMESTER II	SEMESTER III
CORE COURSES: **MBB 441 or 841** **CMPT 341 or 881** **MBB/CMPT 506** **MBB/CMPT 505**		
ELECTIVES: **1 OR 2 COURSES**	**ELECTIVES:** **1 OR 2 COURSES**	**ELECTIVES:** **1 OR 2 COURSES**
	PRACTICUM I	**PRACTICUM II**

APPENDIX A: COURSES:

CMPT 341 INTRODUCTION TO COMPUTATIONAL BIOLOGY: This course introduces students to the computing science principles underlying computational biology. The emphasis is on the design, analysis and implementation of computational techniques. Possible topics include algorithms for sequence alignment, database searching, gene finding, phylogeny, and structure analysis.

CMPT 354 | DATABASE SYSTEMS: Focus is modeling, querying and processing databases, focusing on relational databases. The topics include conceptual database design, entity-relationship model, relational data model, query languages and introduction to SQL, file and record organization, indexing techniques, query processing and optimization.

CMPT 770 | COMPUTER GRAPHICS: This course covers advanced topics and techniques in computer graphics such as solid modeling, curves and surfaces, fractals, particle systems, advanced rendering techniques, animation, and post-production techniques. Research topics in virtual reality, human figure animation, CAD, scientific visualization, and other areas will also be discussed.

CMPT 878 | SCIENTIFIC VISUALIZATION: This course presents advanced topics in the field of scientific visualization. Topics may include: an introduction to visualization (importance, basic approaches and existing tools), abstract visualization concepts, human perception, visualization methodology, 2D and 3D display and interaction, advanced techniques (polygon reduction, volume rendering, multivariate representations, parallel algorithms, etc.) and virtual reality.

CMPT 881 | SPECIAL TOPICS IN THEORETICAL COMPUTING SCIENCE: This course can be included in the study program only when the topic is: **Computational Molecular Biology:** In this course we will study algorithms for the acquisition and analysis of information from Diatonic Sequence similarity; Sequence alignment and multiple sequence alignment; String alignment and algorithms for optimal alignment; Proteins and folding; Physical Mapping; Phylogenies. *Approval will be sought to reconstitute this special topics course as a formal course having a distinct course number* and title.

CPSC 304 | DATABASE MANAGEMENT AND DESIGN: Focus is relational databases, dealing with relational database design, relational database languages, and concepts related to the transaction processing layer (top layer) of a database management system (DBMS).

CPSC 504 | ADVANCED DATABASE DESIGN AND DATA MINING: Organizing information as relations. Information retrieval through queries against relations. Storing relations as data. Efficient storage and retrieval of data needed by queries. Reliability integrity and security considerations in database design.

INFO 501 | CONCEPTS IN COMPUTATION: Introduction to fundamental software concepts and object-oriented approaches. Introduce the elements of logic and discrete mathematics that allow reasoning about computational structures and processes. Study of fundamental algorithms and data structures with emphasis on the importance of data structure choice and implementation for obtaining the most efficient algorithm for solving a given problem.

INFO 502 | CONCEPTS IN MOLECULAR BIOLOGY: This course will provide an introduction to molecular biology. Course topics will include DNA structure and function, gene expression, transcriptional control, protein structure and function, Mendelian genetic analysis, signaling pathways and recombinant DNA technology.

MBB 441/841 BIOINFORMATIC ANALYSIS: This course introduces the history of bioinformatics, classic

algorithms used in the field, common methods of macromolecule analysis (i.e. within areas of sequence alignment, structure analysis, phylogenetic analysis, etc.) and an introduction to bioinformatics-related programming and database connectivity. [MBB 841]

INFO 504 | TOPICS IN ALGORITHMS AND COMPLEXITY – BIOINFORMATICS: This course introduces algorithms and their application in bioinformatics Topics include sequence alignment, phylogenetic tree reconstruction, prediction of RNA and protein structure, gene finding and sequence annotation, gene expression, and biomolecular computing. A solid understanding of principles for design and analysis of algorithms. Some assignments will involve use and extension of software tools, and others will involve written studies of algorithms and their analysis. [CPSC 536A]

MBB/CMPT 505 PROBLEM BASED LEARNING IN BIOINFORMATICS: The problem-based learning course will develop students' ability to exchange ideas in small groups focused on real but simplified problems in bioinformatics. Problems will be carefully selected to cover all aspects of bioinformatics research. The core curriculum is identical during the first year for the graduate diploma and master's students.

MBB/CMPT 506 CRITICAL RESEARCH ANALYSIS: This key seminar series aims to bring to the students recognized Bioinformaticians from around the world. This will provide a forum for the students to interact with these individuals and learn about their latest research. A class prior to each seminar would augment the seminars where student presentations will help discuss in depth salient papers from the speakers laboratory.

MBB/CMPT 601 BIOINFORMATICS RESEARCH ROTATION I: One semester of original bioinformatics research conducted in the lab of a designated mentor. Students are required to write their results in a scientific journal format and defend these results before a panel consisting of the project mentor plus two other qualified faculty members.

MBB/CMPT 602 BIOINFORMATICS RESEARCH ROTATION II: One semester of original bioinformatics research conducted in the lab of a designated mentor. Students are required to write their results in a scientific journal format and defend these results before a panel consisting of the project mentor plus two other qualified faculty members.

MBB/CMPT 603 BIOINFORMATICS RESEARCH ROTATION III: One semester of original bioinformatics research conducted in the lab of a designated mentor. Students are required to write their results in a scientific journal format and defend these results before a panel consisting of the project mentor plus two other qualified faculty members.

MBB 842 | PROTEOMICS: Transition state theory; specificity in enzyme catalyzed reactions; use of recombinant DNA techniques to describe and modify enzyme catalysis, the function of enzymes in organic solvents, and the development of new catalytic activities through monoclonal antibody techniques.

MBB 831 MOLECULAR EVOLUTION OF EUKARYOTE GENOMES: Examination of the dynamics of change in eukaryotic nuclear, mitochondrial, and chloroplast genome structure and organization including mechanisms of gene conversion, transposition, and duplication. Consideration of the origin and function of intron, satellite, and repeated DNA sequences.

MBB 835 GENOMIC ANALYSIS: Topics include: structure and function of the genome with emphasis on genome mapping and sequencing projects, and computational methods for genomic sequence analysis comprising: methods in genomic research, construction of physical genomic maps, ESTs - use and purpose; Sequencing strategies: ordered vs. random; high throughput sequencing; Collection and assembly of data; Gene finding (prediction of genes from DNA sequence; Annotation and release of data; Comparative Genomic analysis; Comparative Genomic analysis; Functional genomics; Genome organization; Future directions.

MEDG 505 GENOME ANALYSIS: Investigation of genetic information as it is organized within genomes, genetic and physical map construction, sequencing technologies, gene identification, database accessing and integration, functional organization of genomes from contemporary, historic and evolutionary perspectives.

STAT 890: (SFU) **SPECIAL TOPICS:**

- **A)** **STATISTICAL METHODS IN BIOINFORMATICS:** Topics include: Univariate and multivariate probability distributions, and conditional probability and independence; methods of statistical inference; stochastic processes: Poisson processes and Markov chains; continuous-time Markov chains, hidden Markov models and random walks; computer intensive approaches to statistical inference and applications to sequence alignment, gene finding and phylogeny.
- **B)** **STATISTICAL INFERENCE FROM HUMAN GENETIC DATA**
  Topics include: Maximum likelihood (ML) estimation of allele frequencies; testing hypotheses and modeling variation with population samples; gene counting and the EM algorithm; and linkage and recombination.
- **C)** **STATISTICAL GENETICS IIA:** Monte Carlo methods in genetic data analysis.
- **D)** **STATISTICAL GENETICS IIB:** Medical genetic studies.
- **E)** **STATISTICAL GENETICS IIC:** Quantitative traits.

STAT 547B : (UBC) **STATISTICAL PROBLEMS IN GENOMICS:** This course will cover quantitative problems arising from current research. We focus on areas in which a statistical approach provides a powerful tool for separating signal from noise. Students will learn to translate genomic research questions into well-defined computational problems. Solutions and algorithms are found which are both theoretically sound and practical to implement. Selected topics: gene expression analysis, analysis of tissue and protein arrays, sequence alignment and comparison, Hidden Markov Models.

APPENDIX B: LIST OF ASSOCIATE FACULTY:

1) D. Baillie (MBB, SFU): Bioinformatics
2) C. Bajdik (Cancer Control Research, BCCA): cancer susceptibility within families
3) C.Beh (MBB, SFU): functional genomics of yeast, microarrays.
4) A. Beckenbach (Biological Sciences, SFU): molecular evolution and phylogeny.
5) B. Brandhorst (MBB, SFU): embryogenesis, gene expression
6) F. Brinkman (MBB, SFU): Bacterial genomics and bioinformatics
7) A. Brooks-Wilson (Genome Sequence Centre, BCCA): Cancer genomics and genotyping
8) C. Dean (SAS, SFU): mapping rates and point processes.
9) W. Davidson (MBB, SFU): molecular, population, and evolutionary genetics
10) M. Ester (CS, SFU): data mining, databases
11) B. Finlay (BL, UBC): bacterial genetics
12) J. Graham (SAS, SFU): population genetics.
13) A. Gupta (CS, SFU): algorithms for computational biology
14) R. Hancock (Micro, UBC): bacterial genomics
15) N. Harden (MBB, SFU): functional genomics of signal transduction in Drosophila
16) N. Hawkins (MBB, SFU): mol genetics and cell biology of flies and nematodes
17) B. Honda (MBB, SFU): chromosome structure and transcriptional regulation
18) P. Hoodless (Terry Fox Lab, BCCA): developmental genetics
19) S. Jones (Genome Sciences Centre, BCCA): Program Director, Bioinformatics.
20) P. Keeling (Botany, UBC): Molecular evolution.
21) T. Kirkpatrick (CS, SFU): human computer interaction, scientific visualization, computer graphics;
22) J. Kronstad (BL, UBC): fungal biology, infection-specific gene expression.
23) M. Leroux (MBB, SFU): protein structure function, proteomics
24) D. Mager (Terry Fox Lab, BCCA) retroelements and their impact on the genome
25) M. Marra (Genome Sciences Centre, BCCA)
26) B. McNeney (SAS, SFU): stats, epidemiology, public health
27) T. Moeller (CS, SFU): Visualization
28) D. Moerman (Zoology, UBC): C. elegans knockouts
29) R. Ng (CS, UBC): database systems, algorithms for analysis of SAGE
30) F. Ouellette (Centre for Bioinformatics, UBC)
31) M. Paetzel (MBB, SFU): structural biology and molecular modeling
32) F. Pio (Molecular Biology & Biochemistry, SFU)
33) A. Rose (Medical Genetics, UBC): genetics of C. elegans.
34) M. Rosin (Cancer Control Research, BCCA): predictive genetic markers for cancer.
35) C. Schwarz (SAS, SFU): generalized linear models and dynamics of animal populations;
36) J. Scott (MBB, SFU): phage display libraries & mol modeling
37) D. Sen (MBB, SFU): combinatorial molecular biology, microarray and nano-technologies.
38) M.J. Smith (MBB, SFU): phylogeny, organellar genomics
39) P. Unrau (MBB, SFU): combinatorial molecular biology and combinatorial mutagenesis.
40) E. Verheyen (MBB, SFU): molecular genetics of Drosophila.
41) K. Wang (CS, SFU): data mining, databases.
42) W. Wasserman (CMMT)

KEY: BL = Biotechnology Laboratory
CMMT = Centre for Molecular Medicine & Therapeutics
CS = Computer Science
MBB = Molecular Biology and Biochemistry
SAS = Statistics and Actuarial Science

Appendix to Proposal for Graduate Diploma in Bioinformatics

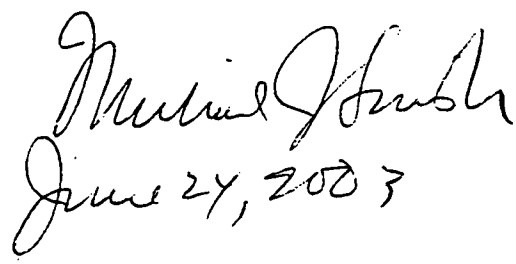
Administrative Structure

The program will be housed in the Faculty of Science. It will be administered by a co-ordinating committee of 4 faculty members: two appointed by the Department of Molecular Biology and Biochemistry and two appointed by the School of Computing Science. This committee will serve as Graduate Program Committee for the diploma. The Graduate Program Chair will be a member of the committee elected by the members of the committee.

Tuition Fees

The diploma will be treated as a fee per semester program with semester fees equal to those for an MSc student in the Faculty of Science.

Prepared by Richard Lockhart, Chair
Faculty of Science Graduate Studies Committee
20 May 2003



Calendar Entry

Graduate Diploma in Bioinformatics

The Department of Molecular Biology and Biochemistry and the School of Computing Science co-operate in offering the graduate diploma in bioinformatics. The administrative home is within the Faculty of Science. The program is administered by a co-ordinating committee consisting of two faculty members each from the Department of Molecular Biology and Biochemistry and the School of Computing Science. This committee serves as Graduate Program Committee for the diploma and the Graduate Program Chair is a member of this committee elected by its members.

This diploma program is designed to provide advanced education in the area of bioinformatics for students with a bachelor's degree in molecular biology, cell biology, biochemistry, computer science, mathematics, or related disciplines. Admission to the program is highly competitive. In addition to serving the needs of the scientific and business communities, this program supports students sponsored by the CIHR Bioinformatics in Health Science Training Grant in which SFU is a full partner with the University of British Columbia and the BC Genome Sciences Centre. Students in this program who are not part of the CIHR program are strongly encouraged to choose their courses from those offered at SFU.

The program requires 33 units, consisting of four core courses (12 units), three elective courses (9 units) and a minimum two semesters of practicum rotations (12 units). Students must obtain a B or better in each class or practicum. Students will have an advisory committee consisting of a senior mentor and two other participating faculty members drawn from the faculty of SFU, UBC, and the BC Genome Sciences Centre. In consultation with mentors the student will be assigned practicums based on the student's needs, area of interest, and background. The results of the practicum semester must be written in journal form that will be the subject of an oral presentation. The advisory committee will grade both the oral presentation and written report.

Students must complete:

MBB 441-3/841-3	Bioinformatics	SFU
CMPT 341-3/881-3	Spec.Topics: Computational Molecular Biology	SFU
MBB/CMPT 505-3	Problem Based Learning in Bioinformatics	SFU, BCCA, CMMT
MBB/CMPT 506-3	Critical Research Analysis	SFU, UBC

plus at least two of

MBB/CMPT 601-6	Research Rotation 1	SFU, UBC, BCCA
MBB/CMPT 602-6	Research Rotation 2	SFU, UBC, BCCA
MBB/CMPT 603-6	Research Rotation 3	SFU, UBC, BCCA

plus three chosen from

MBB 435-3/835-3[1]	Genomic Analysis	SFU
MEDG 505-3[1]	Genome Analysis	UBC
MBB 442-3/842-3	Proteomics	SFU
MBB 659-3[2]	Special Topics in Bioinformatics	SFU
MBB 669-3	Special Topics in Genomics	SFU

MBB 679-3	Special Topics in Proteomics	SFU
MBB 831-3	Molecular Evolution of Eukaryote Genomes	SFU
MBB 832-3	Molecular Phylogeny and Evolution	SFU
CMPT 740-3[5]	Database Systems	SFU
CPSC 536A-3	Topics in Algorithms & Compl. Bioinform	UBC
CPSC 504-3[5]	Advanced Database Design & Data Mining	UBC
CPSC 304-3[4]	Database Management and Design	UBC
CMPT 354-3[4]	Database Systems I	SFU
MBB 331-3[4]	Molecular Biology	SFU
CMPT 770-3	Computer Graphics	SFU
CMPT 878-3	Scientific Visualization	SFU
STAT 547-3	Statistical Problems Arising in Genomics	UBC
STAT 890-4[3]	Statistical Inference from Human Genetic Data	SFU

[1] Credit will be given for only one of MBB 435 or MEDG 505
[2] Special topics courses are given upon student demand and instructor availability
[3] STAT 890 is a Special Topics course number; course content will vary by offering.
[4] CPSC 304, CMPT 354, and MBB 331 will not count toward Elective requirements; they will be recommended if the student is deficient in either computational or life sciences background.
[5] Credit will be given for only one of CMPT 740 and CPSC 504

Semester I	Semester II	Semester III
Core Courses: MBB 441 or 841 CMPT 341 or 881 MBB/CMPT 506 MBB/CMPT 505		
Electives: 1 or 2 courses	**Electives:** 1 or 2 courses	**Electives:** 1 or 2 courses
	Practicum I	Practicum II

Simon Fraser University

New Graduate Course Proposal Form

Department: Molecular Biology and Biochemistry

Course Number: MBB 50[illegible]

(concurrent with CMPT 50[illegible])

Course Title: Critical research analysis

Course Description for Calendar (*append a course outline):* Advanced seminar series for bioinformatics.

Credit Hours:6 Vector: 0-0-6 Prerequisites (if any): Enrolled in GD in Bioinformatics

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Estimated Enrolment: 10 When the course will first be offered: 03-01

Frequency of course offering. *Ad hoc:* Upon agreement of faculty member and individual student.

Justification: This is an advanced seminar series for the GD, MSc, and PhD programs in Bioinformatics. This course consists of a sequence of seminars by leading bioinformaticians from around the world. This will provide a forum for the students to interact with these individuals and learn about their latest research. A class prior to each seminar would augment the seminars where student presentations will help discuss in depth salient papers from the speakers laboratory.

Resources:

Faculty member(s) who will normally teach this course; *append information about their competency to teach the course*: SEE APPENDED LIST:

Number of additional faculty members required in order to offer this course: 0

Additional space required in order to offer this course *(append details):* 0

Additional specialized equipment required in order to offer this course *(append details)*: N.A.

Additional Library resources required *(append details)*: annually: $ 0 one-time: $ 0

Any other resource implications of offering this course *(append details)*: N.A.

If additional resources are required to offer this course, the department proposing the course should be prepared to provide information on the source(s) of those additional resources.

Approvals:

Departmental Graduate Program Committee: [signature] Date: Dec 5, 2002

Faculty Graduate Studies Committee: [signature] Date: 2003/06/20

Faculty: [signature] Date: 6/25/03

Following approval by the Faculty, this form and all relevant documentation should be forwarded to the Assistant Director - Graduate Studies in the Office of the Registrar for consideration by the Senate Graduate Studies Committee, the Senate Committee on Academic Planning and Senate.

newcourseform Form revised August 1995

Simon Fraser University

New Graduate Course Proposal Form

Department: Molecular Biology and Biochemistry

Course Number: MBB 505

(concurrent with CMPT 505)

Course Title: Problem based learning in bioinformatics

Course Description for Calendar (*append a course outline):* The problem-based learning course will develop students' ability to exchange ideas in small groups focused on real but simplified problems in bioinformatics. Problems will be carefully selected to cover all aspects of bioinformatics research. The core curriculum is identical during the first year for post-graduate diploma and for master's students.

Credit Hours:6 Vector: 0-0-6 Prerequisites (if any): Enrolled in GD in Bioinformatics

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Estimated Enrolment: 10 When the course will first be offered: 03-01

Frequency of course offering. *Ad hoc:* Upon agreement of faculty member and individual student.

Justification: This is a problem-based course for the GD, MSc, and PhD programs in Bioinformatics. Each week, a specialist will present students with a problem in some area of bioinformatics. Students will work in small teams under the guidance of the mentor. This course is designed to give students hands-on experience with a variety of topics and techniques in bioinformatics and to teach a team based approach to solving problems.

Resources:

Faculty member(s) who will normally teach this course; *append information about their competency to teach the course*: SEE APPENDED LIST:

Number of additional faculty members required in order to offer this course: 0

Additional space required in order to offer this course *(append details):* 0

Additional specialized equipment required in order to offer this course *(append details)*: N.A.

Additional Library resources required *(append details)*: annually: $ 0 one-time: $ 0

Any other resource implications of offering this course *(append details)*: N.A.

If additional resources are required to offer this course, the department proposing the course should be prepared to provide information on the source(s) of those additional resources.

Approvals:

Departmental Graduate Program Committee: D Z Bali Date: Dec. 5, 2002

Faculty Graduate Studies Committee: R. A Ballet Date: 2003/06/25

Faculty: M. Vlasschke Date: 6/25/03

Following approval by the Faculty, this form and all relevant documentation should be forwarded to the Assistant Director - Graduate Studies in the Office of the Registrar for consideration by the Senate Graduate Studies Committee, the Senate Committee on Academic Planning and Senate.

newcourseform

Form revised August 1995

Simon Fraser University

New Graduate Course Proposal Form

Department: Molecular Biology and Biochemistry Course Number: MBB ~~601~~ 611

(concurrent with CMPT ~~601~~ 611)

Course Title: Research Rotation I

Course Description for Calendar (*append a course outline):* One semester of original bioinformatics research conducted in the lab of a designated mentor. Students are required to write their results in a scientific journal format and defend these results before a panel consisting of the project mentor plus two other qualified faculty members.

Credit Hours:6 Vector: 0-0-6 Prerequisites (if any): Enrolled in GD in Bioinformatics

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Estimated Enrolment: 10 When the course will first be offered: 03-02

Frequency of course offering. *Ad hoc:* Upon agreement of faculty member and individual student.

Justification: This is the research practicum of the graduate Diploma Program in Bioinformatics. Each student in this program is required to complete at least two research practicum semesters. This practicum is designed to give the student the opportunity to do original bioinformatics research, to write a report on his/her work in scientific format, and to defend the work with oral presentation to a panel of experts. All of these skills are necessary to be an effective practical Bioinformatician.

Resources:

Faculty member(s) who will normally teach this course; *append information about their competency to teach the course*: SEE APPENDED LIST:

Number of additional faculty members required in order to offer this course: 0

Additional space required in order to offer this course *(append details):* 0

Additional specialized equipment required in order to offer this course *(append details)*: N.A.

Additional Library resources required *(append details)*: annually: $ 0 one-time: $ 0

Any other resource implications of offering this course *(append details)*: N.A.

If additional resources are required to offer this course, the department proposing the course should be prepared to provide information on the source(s) of those additional resources.

Approvals:

Departmental Graduate Program Committee: [signature] Date: Dec 5, 2003

Faculty Graduate Studies Committee: [signature] Date: 2003/06/25

Faculty: [signature] Date: 6/25/03

Following approval by the Faculty, this form and all relevant documentation should be forwarded to the Assistant Director - Graduate Studies in the Office of the Registrar for consideration by the Senate Graduate Studies Committee, the Senate Committee on Academic Planning and Senate.

Simon Fraser University

New Graduate Course Proposal Form

Department: Molecular Biology and Biochemistry Course Number: MBB ~~602~~ 612

(concurrent with CMPT ~~602~~ 612)

Course Title: Research Rotation II

Course Description for Calendar (*append a course outline):* One semester of original bioinformatics research conducted in the lab of a designated mentor. Students are required to write their results in a scientific journal format and defend these results before a panel consisting of the project mentor plus two other qualified faculty members.

Credit Hours:6 Vector: 0-0-6 Prerequisites (if any): Enrolled in PGD in Bioinformatics

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Estimated Enrolment: 10 When the course will first be offered: 03-02

Frequency of course offering. *Ad hoc:* Upon agreement of faculty member and individual student.

Justification: This is the research practicum of the Post-graduate Diploma Program in Bioinformatics. Each student in this program is required to complete at least two research practicum semesters. This practicum is designed to give the student the opportunity to do original bioinformatics research, to write a report on his/her work in scientific format, and to defend the work with oral presentation to a panel of experts. All of these skills are necessary to be an effective practical Bioinformatician.

Resources:

Faculty member(s) who will normally teach this course; *append information about their competency to teach the course*: SEE APPENDED LIST:

Number of additional faculty members required in order to offer this course: 0

Additional space required in order to offer this course *(append details):* 0

Additional specialized equipment required in order to offer this course *(append details)*: N.A.

Additional Library resources required *(append details)*: annually: $ 0 one-time: $ 0

Any other resource implications of offering this course *(append details)*: N.A.

If additional resources are required to offer this course, the department proposing the course should be prepared to provide information on the source(s) of those additional resources.

Approvals:

Departmental Graduate Program Committee: D E Baillie Date: Dec 5, 2002

Faculty Graduate Studies Committee: R. A. Weller Date: 2003/06/25

Faculty: _____ Date: _____

Following approval by the Faculty, this form and all relevant documentation should be forwarded to the Assistant Director - Graduate Studies in the Office of the Registrar for consideration by the Senate Graduate Studies Committee, the Senate Committee on Academic Planning and Senate.

Simon Fraser University

New Graduate Course Proposal Form

613

Department: Molecular Biology and Biochemistry

Course Number: MBB 6[redacted]

(concurrent with CMPT 603, 613)

Course Title: Research Rotation III

Course Description for Calendar *(append a course outline):* One semester of original bioinformatics research conducted in the lab of a designated mentor. Students are required to write their results in a scientific journal format and defend these results before a panel consisting of the project mentor plus two other qualified faculty members.

Credit Hours:6 Vector: 0-0-6 Prerequisites (if any): Enrolled in PGD in Bioinformatics

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Estimated Enrolment: 10 When the course will first be offered: 03-02

Frequency of course offering. *Ad hoc:* Upon agreement of faculty member and individual student.

Justification: This is the research practicum of the Post-graduate Diploma Program in Bioinformatics. Each student in this program is required to complete at least two research practicum semesters. This practicum is designed to give the student the opportunity to do original bioinformatics research, to write a report on his/her work in scientific format, and to defend the work with oral presentation to a panel of experts. All of these skills are necessary to be an effective practical Bioinformatician.

Resources:

Faculty member(s) who will normally teach this course; *append information about their competency to teach the course*: SEE APPENDED LIST:

Number of additional faculty members required in order to offer this course: 0

Additional space required in order to offer this course *(append details):* 0

Additional specialized equipment required in order to offer this course *(append details)*: N.A.

Additional Library resources required *(append details)*: annually: $ 0 one-time: $ 0

Any other resource implications of offering this course *(append details)*: N.A.

If additional resources are required to offer this course, the department proposing the course should be prepared to provide information on the source(s) of those additional resources.

Approvals:

Departmental Graduate Program Committee: I. Z Ballin Date: Dec 5, 2002

Faculty Graduate Studies Committee: [signature] Date: 2003/06/25

Faculty: M. Roseke Date: 6/25/03

Following approval by the Faculty, this form and all relevant documentation should be forwarded to the Assistant Director - Graduate Studies in the Office of the Registrar for consideration by the Senate Graduate Studies Committee, the Senate Committee on Academic Planning and Senate.

newcourseform Form revised August 1995

Simon Fraser University

New Graduate Course Proposal Form

Department: Molecular Biology and Biochemistry Course Number: MBB 659-3

Course Title: Special Topics in Bioinformatics

Course Description for Calendar (*append a course outline):* Consideration of recent research literature on contemporary topics in bioinformatics.

Credit Hours: 3 Vector:3-0-0 Prerequisites (if any): MBB 441 or 841; or Comp. Sci. 341 or 881

Estimated Enrolment: 5-10 When the course will first be offered: After 03-3.

Frequency of course offering. Upon demand not to exceed once per academic year

Justification: This will be a detailed consideration of contemporary advances in bioinformatics. The course will allow an in depth examination of specific research topics of immediate interest to the student(s).

Resources:

Faculty member(s) who will normally teach this course; *append information about their competency to teach the course*: F. Brinkman (MBB), A. Gupta (Comp. Sci).

Number of additional faculty members required in order to offer this course: 0

Additional space required in order to offer this course *(append details):* 0

Additional specialized equipment required in order to offer this course *(append details)*: n.a.

Additional Library resources required *(append details)*: annually: $ 0 one-time: $ 0

Any other resource implications of offering this course *(append details)*: n.a.

If additional resources are required to offer this course, the department proposing the course should be prepared to provide information on the source(s) of those additional resources.

Approvals:

Departmental Graduate Program Committee: D. T. Ballie Date: Dec 5, 2002

Faculty Graduate Studies Committee: R. Abelard Date: 2003/06/25

Faculty: H. Pluchke Date: 6/25/03

Following approval by the Faculty, this form and all relevant documentation should be forwarded to the Assistant Director - Graduate Studies in the Office of the Registrar for consideration by the Senate Graduate Studies Committee, the Senate Committee on Academic Planning and Senate.

newcourseform Form revised August 1995

COURSE OUTLINE: The course will be a combination of faculty lectures, student seminars, and practical computational exercises based on the contemporary methods and literature of bitoinformatics. Since this is a special topics course a specific list of topics can not be supplied but will vary with each offering and advances in the field.

COMPETENCY OF FACULTY:

Dr. Fiona Brinkman is a faculty member in the Department of Molecular Biology and Biochemistry. Her research and teaching expertise is in bioinformatics. She has established an international reputation in this field, is a MSFHR Scholar, has given numerous short courses for the Canadian Bioinformtics network, has designed and offered our regular Bioinformatics courses (MBB 441 and 841), and is a principal in the CIHR Training Grant in Bioinformatics.

Dr. Arvind Gupta is a full professor in the School of Computing Science with research and teaching expertise in computational biology (bioinformatics). He is also a principal in the CIHR Training Grant in Bioinformatics and has designed and taught Comp. Sci. 881 (Computational Biology). Dr. Gupta is also co-author of the proposal for a "Postgraduate Diploma in Bioinformatics" at Simon Fraser University.

Simon Fraser University

New Graduate Course Proposal Form

Department: Molecular Biology and Biochemistry Course Number: MBB669-3

Course Title: Special Topics in Genomics

Course Description for Calendar *(append a course outline):*

Credit Hours: 3 Vector: 3-0-0 Prerequisites (if any): MBB 435 or 835

Estimated Enrolment: 5-10 When the course will first be offered: After 03-3

Frequency of course offering. Upon demand not to exceed once per academic year.

Justification: This will be a detailed consideration of contemporary advances in genomics. The course will allow an in depth examination of specific research topics of immediate interest to the student(s).

Resources:

Faculty member(s) who will normally teach this course; *append information about their competency to teach the course*: Dr. David Baillie, Dr. Michael J. Smith

Number of additional faculty members required in order to offer this course: 0

Additional space required in order to offer this course *(append details):* 0

Additional specialized equipment required in order to offer this course *(append details)*: 0

Additional Library resources required *(append details)*: annually: $ 0 one-time: $ 0

Any other resource implications of offering this course *(append details)*: 0

If additional resources are required to offer this course, the department proposing the course should be prepared to provide information on the source(s) of those additional resources.

Approvals:

Departmental Graduate Program Committee: D. J. Baillie Date: Dec 5, 2002

Faculty Graduate Studies Committee: R. A. Ballard Date: 2003/06/25

Faculty: M. Ruschke Date: 6/25/03

Following approval by the Faculty, this form and all relevant documentation should be forwarded to the Assistant Director - Graduate Studies in the Office of the Registrar for consideration by the Senate Graduate Studies Committee, the Senate Committee on Academic Planning and Senate.

newcourseform Form revised August 1995

COURSE OUTLINE: The course will be a combination of faculty lectures, student seminars, and practical computational exercises based on the contemporary methods and literature of genomics. Since this is a special topics course a specific list of topics cannot be supplied but will vary with each offering and advances in the field.

COMPETENCY OF FACULTY:

Dr. David Baillie is Professor of Molecular Biology and Biochemistry and a Canadian Research Chair in Genomics. He is an acknowledged international leader in the field of genomics. He has developed both our undergraduate and graduate courses in genomics (MBB 435 and 835).

Dr. Michael J. Smith is Professor and Chair of the Department of Molecular Biology and Biochemistry. He has worked on both genomic and organellar DNA for over 30 years. He developed and teaches the MBB graduate course on "Molecular Evolution and Phylogenetics".

Simon Fraser University

New Graduate Course Proposal Form

Department: Molecular Biology and Biochemistry Course Number: MBB 679-3

Course Title: Special Topics in Proteomics

Course Description for Calendar *(append a course outline):* Consideration of recent research literature on contemporary topics in bioinformatics.

Credit Hours: 3 Vector:3-0-0 Prerequisites (if any): MBB 442 or 842

Estimated Enrolment: 5-10 When the course will first be offered: After 03-3.

Frequency of course offering. Upon demand not to exceed once per academic year

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Justification: This will be a detailed consideration of contemporary advances in proteomicss. The course will allow an in depth examination of specific research topics of immediate interest to the student(s).

Resources:

Faculty member(s) who will normally teach this course; *append information about their competency to teach the course*: Dr. F. Pio, Dr. M. Paetzel

Number of additional faculty members required in order to offer this course: 0

Additional space required in order to offer this course *(append details):* 0

Additional specialized equipment required in order to offer this course *(append details)*: n.a.

Additional Library resources required *(append details)*: annually: $ 0 one-time: $ 0

Any other resource implications of offering this course *(append details)*: n.a.

If additional resources are required to offer this course, the department proposing the course should be prepared to provide information on the source(s) of those additional resources.

Approvals:

Departmental Graduate Program Committee: D T Baillie Date: Dec 5, 2002

Faculty Graduate Studies Committee: D. Abelhut Date: 2003/06/25

Faculty: M. Paetzel Date: 6/25/03

Following approval by the Faculty, this form and all relevant documentation should be forwarded to the Assistant Director - Graduate Studies in the Office of the Registrar for consideration by the Senate Graduate Studies Committee, the Senate Committee on Academic Planning and Senate.

newcourseform Form revised August 1995

COURSE OUTLINE: The course will be a combination of faculty lectures, student seminars, and practical computational exercises based on the contemporary methods and literature of proteomics. Since this is a special topics course a specific list of topics cannot be supplied but will vary with each offering and advances in the field.

COMPETENCY OF FACULTY:

Dr. F. Pio is a faculty member in the Department of Molecular Biology and Biochemistry. Dr. Pio has expertise in both X-ray crystallographic protein structure studies but also proteomics. He is ASI Fellow, obtained one of the first NSERC Genomics grants (to develop proteomics algorithms to analyze data bases for functional groups), and has designed and taught the proteomics courses in this Department (MBB 442 and 842).

Dr. Mark Paetzel is a new faculty member in Molecular Biology and Biochemistry. He is expert in the field of protein structure and function and is MSFHR Scholar. Dr. Paetzel has also been successful in spearheading a successful CFI proposal for a protein X-ray diffraction facility in MBB. Dr. Paetzel is expert in proteomics and computational methods applicable to analyses of protein structure and function.

W.A.C. Bennett Library
Simon Fraser University
Memorandum

To: Michael Smith, Dept of MBB

From: Gwen Bird
Head, Collections Management
gbird@sfu.ca

Subject: Library Assessments for MBB 505-506

Cc: Leslie Rimmer, Liaison Librarian for MBB

Date: June 23, 2003

Here is the Library's assessment for the following MBB/CMPT courses:

MBB 505 Problem based learning in Bioinformatics
MBB 506 Critical research analysis

These courses will be offered beginning in 2003-01 on an ad hoc basis, by agreement of a supervising faculty member and the individual students.

MBB 505 is a problem-based course in which a specialist will present students with a problem in bioinformatics. Students will work in teams under the guidance of the mentor.

MBB 506 is an advanced seminar led by bioinformaticians from around the world. Students will learn about recent research, including preparation discussing salient papers from the speaker's laboratory.

The specific topics under discussion in both courses will depend on recent advances in the field. Therefore, only a general assessment of the Library's collection in bioinformatics can be provided. The Library is already actively collecting material in this subject area, including monographs and the following journals:

Briefings in Bioinformatics
BMC Bioinformatics
Bioinformatics
Computational biology and chemistry
Computers in biology and medicine
IEEE Transactions on Information Technology in Biomedicine
Information Processing Letters
Journal of Computational Biology
Proteomics
RECOMB: Proceedings of the Annual International Conference on Computational Molecular Biology

The Library's holdings are adequate to support these courses.

Costs: THERE ARE NO COSTS ASSOCIATED WITH THESE COURSES.

If you have any questions regarding these assessments, please don't hesitate to contact me by phone (3263) or by email, gbird@sfu.ca.

W.A.C. Bennett Library
Simon Fraser University
Memorandum

To: Michael Smith, Dept of MBB

From: Gwen Bird
Head, Collections Management
gbird@sfu.ca

Subject: Library Assessments for MBB 601, 602 & 603

Date: June 23, 2003

Cc: Leslie Rimmer, Liaison Librarian for MBB

Here is the Library's assessment for the following Research Rotation courses in MBB:

MBB 601-6 Bioinformatics Research Rotation I
MBB 602-6 Bioinformatics Research Rotation II
MBB 603-6 Bioinformatics Research Rotation III

These courses will be offered beginning in 2003-02 on an ad hoc basis, by agreement of a supervising faculty member and an individual student. This is the research practicum component of the post-graduate diploma in Bioinformatics, jointly offered by MBB and Computing Science. Each student in the program will be required to complete at least two research practicum semesters.

The coursework will consist of original bioinformatics research conducted by the student, and the writing of a report in scientific format, and the defense of this work with an oral presentation before a panel of experts.

As it is not possible to predict the specific topics of the student research, only a general assessment of the Library's collection in bioinformatics can be provided. The Library is already actively collecting material in this subject area, including monographs and the following journals:

Briefings in Bioinformatics
BMC Bioinformatics
Bioinformatics
Computational biology and chemistry
Computers in biology and medicine
IEEE Transactions on Information Technology in Biomedicine
Information Processing Letters
Journal of Computational Biology
Proteomics
RECOMB: Proceedings of the Annual International Conference on Computational Molecular Biology

The Library's holdings are adequate to support these courses.

Costs: THERE ARE NO COSTS ASSOCIATED WITH THESE COURSES.

If you have any questions regarding these assessments, please don't hesitate to contact me by phone (3263) or by email, gbird@sfu.ca.

W.A.C. Bennett Library
Simon Fraser University
Memorandum

To: Michael Smith, Dept of MBB

Subject: Library Assessments for MBB 659, 669 & 679

Cc: Leslie Rimmer, Liaison Librarian for MBB

From: Gwen Bird
Head, Collections Management
gbird@sfu.ca

Date: June 23, 2003

Here is the Library's assessment for the following Special Topics courses in MBB:

MBB 659-3 Special Topics in Bioinformatics
MBB 669-3 Special Topics in Genomics
MBB 679-3 Special Topics in Proteomics

These proposed courses will be offered after 2003-3 with an expected enrollment of 5-10 students. These courses are part of the post-graduate diploma in Bioinformatics, jointly offered by MBB and Computing Science.

There are regular course offerings in the areas of Bioinformatics, Genomics and Proteomics that are supported by current library resources.

As these are Special Topics courses it is difficult to do a course assessment when the content can and will likely change over time, and no specific course outline has been provided. Although no extra Library resources are required at this time, the Library reserves the right to reassess the collection when one of the Selected Topics course offerings is offered as a course of its own.

Costs: THERE ARE NO COSTS ASSOCIATED WITH THESE COURSES.

If you have any questions regarding these assessments, please don't hesitate to contact me by phone (3263) or by email, gbird@sfu.ca.