SIMON FRASER UNIVERSITY

OFFICE OF THE VICE-PRESIDENT, ACADEMIC

MEMORANDUM

To: Senate

From: D. Gagan, Chair *~~David Gagan~~*
Senate Committee on Academic Planning

Subject: Faculty of Applied Sciences -
Curriculum revisions

Date: November 12, 1996

Action undertaken by the Senate Committee on Undergraduate Studies and the Senate Committee on Academic Planning gives rise to the following motion:

Motion:

"that Senate approve and recommend approval to the Board of Governors the curriculum revisions for the Faculty of Applied Sciences as set forth in S.96-73 as follows:

S.96-73a School of Computing Science -
New Specialist Programs:
Specialist Program in Multimedia Computing
~~Specialsit Program in Software Engineering~~" *held over to January Mtg.*

For Information:
Acting under delegated authority of Senate, SCUS approved revisions as set forth in S.96-73

        a)   School of Computing Science
        b)   School of Engineering Science
        c)   School of Kinesiology

In all cases agreement has been reached between the Faculty and the Library in the assessment of library costs associated with new courses.

Any Senator wishing to consult the full report of curriculum revisions within the Faculty of Applied Sciences should contact Bobbie Grant, Senate Assistant at 291-3168 or e-mail bgrant@sfu.ca

FOR APPROVAL

   a)   <u>School of Computing Science</u>
       i)   New Specialist Programs:
          Specialist Program in Multimedia Computing
          Specialist Program in Software Engineering

FOR INFORMATION

   ii)   Acting under delegated authority, SCUS approved curriculum revisions of a minor nature as follows:

New courses:

CMPT 308 - 3	Computability and Complexity
CMPT 379 - 3	Principles of Compiler Design
CMPT 466 - 3	Animation
CMPT 471 - 3	Networking II
CMPT 475 - 3	Software Engineering II

   iii)   Resequencing of courses:
Replacement of:

CMPT 105 - 3	Computer Organization and Assembly Language Programming
CMPT 290 - 3	Introduction to Digital Systems
CMPT 390 - 3	Digital Circuits and Systems

with:

CMPT/ENSC 150 - 3 Introduction to Computer Design
CMPT/ENSC 250 - 3 Introduction to Computer Architecture

   iv)   Prerequisite changes: CMPT 110, 212, 371, 400, 468, 469, 499
   v)   Course deletions:

CMPT 105 - 3	Computer Organization and Assembly Language Programming
CMPT 302 - 3	System Development Projects
CMPT 390 -3	Digital Circuits and Systems

   vi)   Course to be phased out:

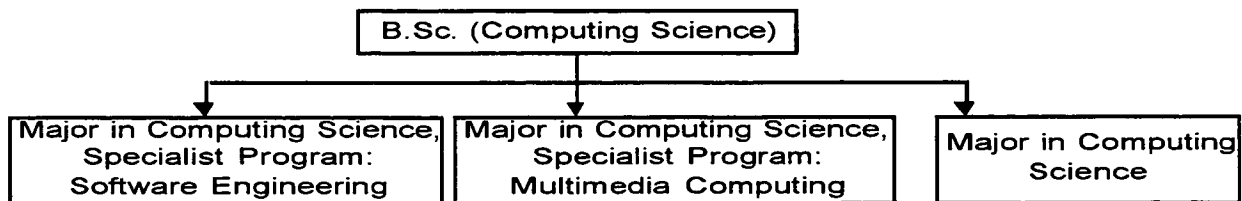|	
CMPT 290 - 3	Introduction to Digital Systems

A Proposal for Specialist Program in Multimedia Computing

What Is a Specialist Program?

A *specialist program* is essentially an extended major program. Two specialist programs, in Software Engineering and Multimedia Computing, are being proposed. The B.Sc. degree (as well as the B.A. degree) with a major in Computing Science will continue to exist. They will be called the *general program*, as distinguished from the specialist program. The differences between the two are as follows:

1. A specialist program has at least all lower division course requirements as the general program. In case of Multimedia Computing, there are additional lower division course requirements due to its multidisciplinary flavor.

2. A specialist program has a separate list of required/elective upper division courses, in lieu of current depth and breadth requirements of the general program.

3. The requirement of liberal arts electives remains the same for general and specialist programs. In case of Multimedia Computing, the Contemporary Arts courses taken can be used to fulfill this requirement.

Students in either the general program or a specialist program will graduate with a B.Sc. (Computing Science) which is recognized in the degree diploma. They will be recognized in their transcript as majors in Computing Science. For graduands of a specialist program, the name of the specialist program will be printed on the transcript as well. In the diagram below, the wording at the top level will be shown in the diploma and that in one of the three boxes at the bottom level will be shown in the transcript.

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                    B.Sc. (Computing Science)
          ┌──────────────────┼──────────────────┐
          ▼                   ▼                  ▼
Major in Computing Science,  Major in Computing Science,  Major in Computing
 Specialist Program:          Specialist Program:              Science
 Software Engineering         Multimedia Computing
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What is Multimedia Computing?

Traditionally, computers deal with numbers and text as the primary data types. Recently, computers have begun to provide the user community with ways to handle images, audio, and video. Multimedia computing is concerned with computing issues that arises due to the introduction of these new data types.

Why Specialist Program in Multimedia Computing?

It is quite clear that the recent hardware/software developments in multimedia open up a whole new application area for Computing Science, especially in education, medicine, publishing and artistic/entertainment industry. It is a new challenge for a CS department to provide the students with fundamental knowledge about these new media. It includes not only the technical aspects, e.g. how the computer handles these media, but also the historical and cultural aspects of multimedia applications, which provides a socio-economic context for the former. Thus a multi-disciplinary approach to this program is essential. At present, we are in partnership with Schools of Communications and Contemporary Arts to develop a curriculum that draws on the complimentary expertise of three Schools.

The multimedia industry is really a confluence of communications, computer and entertainment industries. From the employment viewpoint, the lower mainland boasts of several major companies in computer games and animated movies, including the newly opened branch of Walt-Disney Television Studio. Most organizations have already discovered multimedia computing. For example, Internet publishing in general contains a mixture of audio, still and moving images. While tools in setting up web pages are plenty, design skills are needed to make them look attractive.

Similar Programs in other Canadian CS departments

To our best knowledge, there is no similar program, yet, at other Canadian universities. UNB and Concordia are proposing their new options in multimedia. (UNB actually has a multimedia building on campus.) University of Alberta is implementing a CS-Major/FineArts-Minor program. Many other universities, e.g. Western Ontario, are either proposing, or have actually introduced multimedia courses.

Multimedia Computing at SFU

Ideally, a full-fledged, multidisciplinary degree program in multimedia, funded by new monies from the University and/or the Province should be our ultimate goal. Unfortunately, it will take time to achieve this goal. At the time being, neither the School of Communications nor the School of Contemporary Arts are heavily oriented toward multimedia. For example, the film program of the latter is more into movie making than production technology. To make a multimedia degree program viable, we need to hire more faculty in this area, which may not be easy to accomplish, given the current fiscal situation of the University. There is also the question of obtaining provincial approval for such a new degree program. Under these circumstances, we should consider a short-term, more modest action-plan, which does not entail substantial relocation of resources within CS. This plan includes an addition of a 400-level course in animation and establishment of a specialist program in multimedia computing.

In a way, the multimedia computing program can be viewed as an extension of our computer graphics program, which is immensely popular with both undergraduate and graduate students. CMPT 363-3 is currently being re-designed to include more human factors materials. Animation is now part of CMPT 461 (Advanced Computer Graphics). With the growing importance of animation, it is only proper to spin it off as the main topic of a separate course.

Program Requirements:

Lower Division Courses:

All lower division requirements for CMPT majors (about 40-42 credit-hours), plus

FPA 111-3 Issues in the Fine and Performing Arts, and

at least two of the following:

FPA 147-3 Introduction to Electroacoustic Music
FPA 247-3 Electroacoustic Music I
FPA 279-3 Special Topics Course (i.e. New Technology and the Arts)
FPA 290-3 Video Production I
CMNS 259-3 Acoustic Dimensions of Communication I

Upper Division Courses:

At least 39 semester hours of CMPT upper division courses, which should include CMPT courses in the following required/elective courses.

Required Courses (7):

CMPT 300-3 Operating Systems I
CMPT 307-3 Data Structures and Algorithms
CMPT 320-3 Social Implications of a Computerized Society
CMPT 361-3 Introduction to Computer Graphics
CMPT 363-3 User Interface Design
CMPT 365-3 Multimedia Systems
FPA 315-3 The Arts in Context: The Contemporary Period

At least 5 of the following electives (at least 3 must be at 400 level, at least 3 must be of CMPT and at least 1 in non-CMPT):

CMPT 310-3 Artificial Intelligence Survey
CMPT 354-3 Database Systems and Structures
CMPT 371-3 Data Communications and Networking
CMPT 412-3 Computational Vision
CMPT 414-3 Model-Based Computer Vision
CMPT 461-3 Advanced Computer Graphics
CMPT 466-3 Animation (New Course)
CMPT 468-3 Scientific Visualization
FPA 330-3 Film Sound
FPA 353-3 Playmaking IV (i.e. Story Structure)
FPA 390-3 Video Production II
CMNS 358-4 Sound Tape Recording: Theory and Uses
CMNS 359-4 Acoustic Dimensions of Communication II

Notes on FPA courses:

1. Relevant FPA Lower/Upper Division Special Topics courses may be applied to the above requirement with the approval of the Director of Undergraduate Studies (CS)
2. Some FPA courses listed above requires pre-requisites that are not included here. Where possible, prerequisites for FPA courses will be waived or adjusted, so that CS students in the special program can receive access.
3. Some FPA courses, such as those that are related to video production, are currently oversubscribed. The CS and the School of Contemporary Arts are looking into solutions that may resolve the resource problems. We agree that we should try to mix the CS students with the FPA students within the same class to achieve the cross-fertilization effects.

Simon Fraser University
Psychology Department
CC 8308

Roger Blackman
Chair, SCUS
291-5486

MEMORANDUM

To: David Gagan, Chair of SCAP

Date: October 22, 1996

Topic: Disputed Title: Software Engineering

SCUS is recommending to SCAP changes in the curriculum of the School of Computing Science including the introduction of two new "specialist programs," one of which is in "software engineering." I should draw your attention to a dispute regarding the use of this term.

The School of Engineering Science objects to Computing Science using the term "software engineering" on the following grounds:

- the term "Engineer" is legally protected;

- allowing use of the program name "software engineering" by Computing Science would dilute the meaning of "engineering" and diminish its value;

- graduates of the program may mistakenly believe that they are professionally qualified engineers;

- alternative terms that do not pose such problems are available (e.g., "software design");

- adoption of the proposed term may result in legal action (as has been threatened at Memorial University).

The School of Computing Science offers the following arguments in rebuttal:

- the term "software engineer" is a common designation for jobs that are often filled by applicants with computing science but not necessarily engineering credentials;

- the term is currently used in the title of computing science programs at both Memorial and Toronto;

1   *b.*

- the term is well understood by computing science students and is a better descriptor than suggested alternatives;

- the calendar text would include a specific disavowal that graduates of the proposed specialist program in "software engineering" were qualified "Engineers."
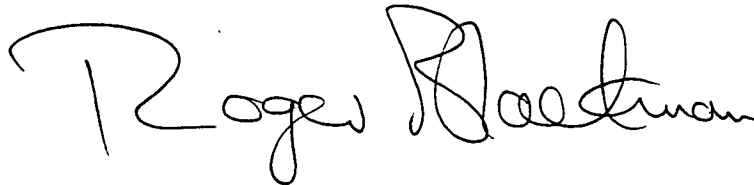
There appear to be three potential problems if this title is adopted.

First, it may diminish the value of the term for the engineering profession. SCUS feels that this is unlikely given evidence that use of the term "software engineering" is already widespread.

Second, students may be misled into believing that completion of the program confers on them a professional engineering qualification. SCUS believes that this threat can satisfactorily be countered by use of a clear, prominently placed disclaimer in the text of the Calendar and any other advertising materials.

Third, there is threat of legal action. SCUS is in no position to judge the legal liability of the University in this matter. That should be assessed before adoption of the proposed changes.

CC: W. Luk, Director, School of Computing Science
      J. Vaisey, ENSC Undergraduate Curriculum Committee Chair
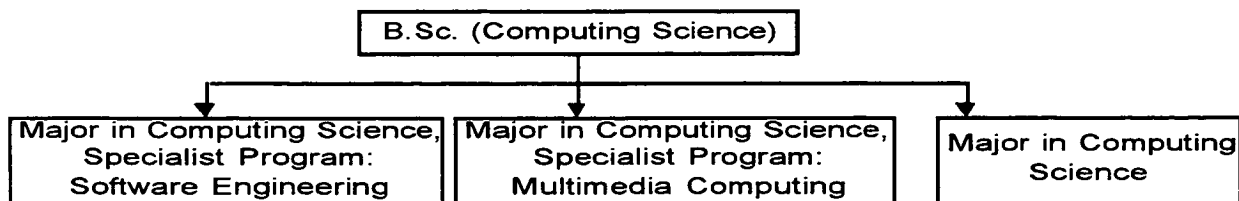
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A Proposal for Specialist Program in Software Engineering

What Is a Specialist Program?

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                    ┌────────────────────────────────┐
                    │   B.Sc. (Computing Science)    │
                    └────────────────────────────────┘
       ┌─────────────────────┼─────────────────────────┐
       ▼                     ▼                          ▼
┌──────────────────┐ ┌──────────────────┐   ┌──────────────────┐
│ Major in         │ │ Major in         │   │                  │
│ Computing        │ │ Computing        │   │ Major in         │
│ Science,         │ │ Science,         │   │ Computing        │
│ Specialist       │ │ Specialist       │   │ Science          │
│ Program:         │ │ Program:         │   │                  │
│ Software         │ │ Multimedia       │   │                  │
│ Engineering      │ │ Computing        │   │                  │
└──────────────────┘ └──────────────────┘   └──────────────────┘
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What is Software Engineering?

We define Software Engineering (SE) in a broader sense than many people do. This encompasses the entire software development cycle, in terms of both process and techniques. This is in line with most of the SE programs in Canadian CS departments, and what the industry comes to expect from a university graduate in SE. Indeed, this broad-based definition is consistent with all engineering disciplines in universities.

Why Specialist Program in Software Engineering?

It is almost universally recognized that the computer software/hardware scene is constantly changing. What is new is that the pace of change is accelerating. These changes have profoundly impacted the development of a software system. Five years ago, it was not uncommon to find large teams of in-house programmers developing mainframe/dumb-terminal. applications using traditional programming languages. Now, a typical software system runs on a

PC, is equipped with an easy-to-use graphical user interface (GUI) and accesses remote databases over the LAN/WAN. In the near future, most software systems will have to be network-enabled over a mail/messaging/telephone system and/or the Internet. A software developer has to understand the fundamentals of a slate of GUI, database, networking and other system components with which his/her application must interact.

The system development process has also changed drastically. Rapid prototyping is often the norm. Companies find it difficult to proceed with multi-year projects as it becomes next to impossible to predict short-term changes in computer industry, and indeed, the business the company is in.

Clearly we have to adapt our curriculum in view of the revolutionary changes in the development of software systems. We added a course in rapid prototyping last year. This year, two new courses are being proposed, in advanced software engineering (largely process-oriented) and networking respectively. Without a doubt, more curriculum changes in relation to SE will be forthcoming. It is therefore desirable to package these related courses for update and maintenance purposes, which is one of main reasons for establishing a specialist program in SE. In view of an unusually large number of upper division courses on the calendar, it would be difficult to keep track of them without a convenient packaging.

Visibility is another main reason. It would attract some prospective students who are interested in software engineering jobs. For those students pursuing an intense study of software engineering courses, a formal recognition as such is highly desirable.

Similar Programs in other Canadian CS departments

Many CS departments across Canada have begun to implement programs that focus on SE. Most of these programs are implemented as options for their majors/honors programs. A specialist program in SE was established by the CS department at Toronto in May 1995. It has already attracted 61 students over a period of 9 months, out of a total 290 majors (i.e. Honors in the Ontario system). University of Waterloo likewise has established an SE option in the CS department jointly with Electrical Engineering Department. At UBC, the CS department is actively recruiting more faculty in SE. Continuing Studies at UBC has been offering a certificate program in SE for several years. Computing Science department at University of Alberta has just introduced three SE courses. The CS department in University of Calgary are looking for 4 faculty members in various areas of SE in support of their NSERC industrial chair in SE. The list goes on.

Software Engineering at SFU

In this School, there have been talks from time to time about establishing a 400-level course in SE. We made SE as the top area for recruiting faculty, but the hiring freezing has put a stop to our recruitment efforts. It is unlikely we may have a SE faculty champion in place for at least another year. We can no longer afford doing nothing in the area of SE. While Engineering Science at SFU is not yet in the position to offer their own software engineering option, other BC universities will, notably the new Technical University of BC which is actively looking for unique degree programs to offer. To deliberate our SE strategies, a UCC sub-committee was set up for this purpose. We have also consulted Wolfgang Strigel, the head of Software Productivity Centre, and his colleagues Geoff Flamank and Kal Toth on SE curriculum issues.

The first priority of the Subcommittee is a full-fledged degree program in software engineering funded by new monies from the University and/or the Province. This will be jointly offered by the Schools of Computing Science and Engineering Science. Unfortunately, this is not an immediately achievable goal, especially under the current fiscal climate. There is also the question of obtaining provincial approval for such a new degree program. Under these circumstances, the

committee recommend that while we should proceed immediately with a plan to pursue a full-fledged SE program with joint CS and ES participation, we should consider a short-term, more modest action-plan, which does not entail a major relocation of resources within CS. This plan includes an addition of a 400-level course in SE and establishment of a specialist program in SE, which is focused on software, particularly systems-level software. A new networking course is being introduced at the same time, which will provide a good understanding of various aspects of modern networking applications, such as messaging systems and security. Incidentally, the CS Industrial Advisory Board has strongly recommended the establishment of this course.

Program Requirements (Upper Division):

At least 45 semester hours of CMPT upper division courses, which should include the CMPT required/elective courses and ENSC 351

Principles for selecting courses on the required/elective lists

- By the very definition of a specialist program, it should focus on its specialty and not be wide open. In the context of a software engineering specialist program, this implies that the required courses and electives must be limited to those which are directly related to the entire software development cycle, in terms of both process and technique. This is in accordance with one of the prime motivations of the program: visibility.
- On the process side, courses that are directly directed to SE are those which emphasize on SE methodologies and process.
- On the technique side, courses that are directly related to SE are those which provide basic fundamentals of modern software systems/components that applications program must interact (i.e. operating system and middle-layer system). In particular:
  - System-oriented courses are preferred. That is, courses that emphasize on the understanding of how the whole system works are more suitable than those which emphasize on design of a particular set of algorithm(s) that belong to some narrow aspects of the system.
  - Broadly based courses are preferred, in comparison with more specialized courses in the same area.

Required Courses (7):

CMPT 300-3 Operating Systems I
CMPT 307-3 Data Structures and Algorithms
CMPT 320-3 Social Implications of a Computerized Society
CMPT 354-3 Database Systems I
CMPT 363-3 User Interface Design
CMPT 371-3 Data Communications and Networking
CMPT 475-3 Software Engineering II (New Course)

At least five of the following electives: (at least 3 must be at 400 level)

CMPT 301-3 Information System Management
CMPT 370-3 Information System Design
CMPT 379-3 Principles of Compiler Design
CMPT 383-3 Comparative Programming Languages
CMPT 401-3 Operating Systems II
CMPT 402-3 Operating System Software Laboratory
CMPT 454-3 Database Systems II

10.

CMPT 470-3 Advanced Application Development Tools
CMPT 471-3 Networking II (New Course)
CMPT 487-3 Software Engineering Tools and Environments
ENSC 351-4 Real Time and Embedded Systems

SIMON FRASER UNIVERSITY
SCHOOL OF COMMUNICATION
INTERNAL MEMORANDUM

To: Wo-Shun Luk, Director, Computing Science

From: Brian Lewis, Director

Date: 8 May 1996

On behalf of the School of Communication I wish to express our support for the Specialist Program you are developing in the area of multimedia.

I believe we can make significant contributions to this new Program, both in support of the technical side of the Program, involving laboratory courses in the areas of sound and video production, and in support of the conceptual and design side of the program, involving courses in theory and audience effects.

This is an important potential growth area for the University. I look forward to working with you.

Brian Lewis

MEMORANDUM

TO: Wo-Shun Luk, Director
  School of Computing Science

FROM: Owen Underhill, Director
   School for the Contemporary
   Arts

SUBJECT: Proposal for Specialist
   Program in Multimedia
   Computing

DATE: July 8, 1996

I am writing to support and endorse your most recent proposal for a Specialist Program in Multimedia Computing. The process of consultation with our School has gone very well, and I look forward to seeing some of your students in our classes. As has been discussed in previous meetings involving members of our respective Schools, I hope that we will be able to undertake new collaborative ventures in the future.

Owen Underhill

c: Peter Froehlich, Chair,
 Contemporary Arts Curriculum Committee

Simon Fraser University
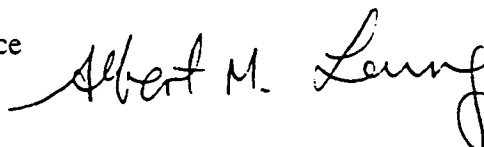## School of Engineering Science

MEMORANDUM

TO: Wo-Shun Luk, Director
School of Computing Science

FROM: Albert M. Leung, Director
School of Engineering Science

DATE: July 4, 1996

SUBJECT: Proposal for Specialist Program in Software Engineering

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I am writing to indicate our strong support of the proposed Specialist Program in Software Engineering. I believe this program is of significant interest to local industry, and can prepare many students for an exciting career.

Software Engineering is an area in which Computing Science and Engineering Science have a lot in common, both in interest and expertise. In addition to Professor John Dill, who is currently working with your group in the design of this new program, there are several others here who are also very interested in this initiative. I hope our collaboration will continue to grow and would like to see a strong Software Engineering Program mature in a few years time as a result of the joint effort of the two schools.

cc: John Dill

AML:lcs

14.

FOR INFORMATION

b) <u>School of Engineering Science</u>

Acting under delegated authority, SCUS approved curriculum revisions of a minor nature as follows:

New courses:
ENSC/CMPT 150 - 3 Introduction to Computer Design
ENSC 151 - 2   Digital and Computer Design Laboratory
ENSC 201 - 3   The Business of Engineering
ENSC 220 - 3   Electric Circuits I
ENSC/ENSC 250 - 3 Introduction to Computer Architecture
ENSC 320 - 3   Electric Circuits II
ENSC 350 - 3   Digital Systems Design
ENSC 263 - 3   Special Topics in Engineering Science
ENSC 264 - 4   Special Topics in Engineering Science
ENSC 363 - 3   Special Topics in Engineering Science
ENSC 364 - 4   Special Topics in Engineering Science
ENSC 406 - 2   Social Responsibility and
                    Professional Practice
ENSC 450 - 4   VLSI Systems Design

ii) Change of title and description: ENSC 102, 204, 230, 304, 305, 325, 351, 387, 383, 424, 481, 483, 488, 489

iii) Change of credit hours: ENSC 101 - 0 to ENSC 101 - 1

iv) Change of number and credit hours:
ENSC 222 - 5 to ENSC 225 - 4
ENSC 370 - 4 to ENSC 340 - 3
ENSC 281 - 4 to ENSC 380 - 3

v) Prerequisite or corequisite changes: ENSC 380, 325, 327, 383, 387, 400, 401, 402, 424, 428, 429, 483, 488, 489, 491, 495

vi) Course deletion:
ENSC 125 - 5   Basic Electronics Engineering

vii) Courses to be phased out:
ENSC 222 - 5   Electronic Design I
ENSC 281 - 4   Linear Systems
ENSC 300 - 3   Engineering Design and Management
ENSC 301 - 3   Engineering Economics
ENSC 306 - 1   Research Methods for Engineers
ENSC 370 - 4   Transducers and Embedded Systems
ENSC 407 - 1   Engineering Law and Ethics
ENSC 408 - 0   Writing for Publication

viii) Calendar and Option by Option Curriculum changes

15.

FOR INFORMATION

c)   <u>School of Kinesiology</u>

Acting under delegated authority, SCUS approved curriculum revisions of a minor nature as follows:

i)   Change of pre/co-requisite: KIN 343
ii) Changes of title, number and prerequisite: KIN 220
iii) Change of vector: KIN 415