**OFFICE OF THE
VICE-PROVOST, LEARNING & TEACHING**

Strand Hall 3034
8888 University Drive
Burnaby B.C. Canada V5A 1S6

TEL + 1 778 782 5433
avplt@sfu.ca
SFU.CA/vpacademic/learnteach

MEMORANDUM

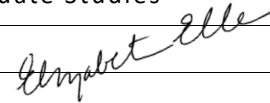| ATTENTION:	Senate
FROM:	Elizabeth Elle, Vice-Chair, Senate Committee on Undergraduate Studies
RE:	New Course Proposals
DATE:	14 October 2022

For information:

Acting under delegated authority at its meeting of October 13, 2022 SCUS approved the following curriculum revision effective Summer 2023.

a. Faculty of Applied Sciences

1. School of Mechatronic Systems Engineering

 (i) New Course Proposals (SCUS 22-51)

- MSE 360-3, Introduction to Biosystems Engineering
- MSE 413-3, Machine Learning in Mechatronics (SCUS 22-62)
- MSE 460-3, Precision AgriTech Engineering

Senators wishing to consult a more detailed report of curriculum revisions may do so on the Senate Docushare repository at https://docushare.sfu.ca/dsweb/View/Collection-12682.

SFU

COURSE SUBJECT MSE   **NUMBER** 360

COURSE TITLE LONG — for Calendar/schedule, no more than 100 characters including spaces and punctuation

Introduction to Biosystems Engineering

COURSE TITLE SHORT — for enrollment/transcript, no more than 30 characters including spaces and punctuation

Intro Biosystems Eng

CAMPUS where course will be normally taught: ☐ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

COURSE DESCRIPTION — 50 words max. Attach a course outline. Don't include WQB or prerequisites info in this description box.

Introduction to biosystems engineering with relation to agriculture and agricultural engineering. Covers natural resource management including water irrigation, scheduling, conservation and contaminants; soil and soil erosion. Controlled environments for agricultural. Introduction to agricultural machinery. All with a focus on sustainable agricultural practices and understanding the environmental impact assessments of technology and agricultural practices.

REPEAT FOR CREDIT ☐ YES ☑ NO   Total completions allowed [ ]   Within a term? ☐ YES ☐ NO

LIBRARY RESOURCES

NOTE: Senate has approved (S.93-11) that no new course should be approved by Senate until funding has been committed for necessary library materials. Each new course proposal must be accompanied by the email that serves as proof of assessment. For more information, please visit www.lib.sfu.ca/about/overview/collections/course–assessments.

RATIONALE FOR INTRODUCTION OF THIS COURSE

The proposed new Agri-Tech Option within MSE is based on building expertise and HQP to further the technology-based innovation within the Agricultural industry which is especially pertainant for BC. This Course will allow students to understand the environment and resources needed for the agricultural industry.

SCHEDULING AND ENROLLMENT INFORMATION

Effective term and year (e.g. FALL 2016) Summer 2023

Term in which course will typically be offered ☐ Spring ☐ Summer ✔ Fall

Other *(describe)*

Will this be a required or elective course in the curriculum? ✔ Required ☐ Elective

What is the probable enrollment when offered? Estimate: 30

UNITS
Indicate number of units: 3

Indicate no. of contact hours: 3 Lecture ☐ Seminar ☐ Tutorial ☐ Lab ☐ Other; explain below

OTHER

FACULTY

Which of your present CFL faculty have the expertise to offer this course?

New faculty will be hired to teach this Course

WQB DESIGNATION

(attach approval from Curriculum Office)

PREREQUISITE AND / OR COREQUISITE

CHEM 120 (pre-req)

EQUIVALENT COURSES [For more information on equivalency, see Equivalency Statements under Information about Specific Course components.]

1. SEQUENTIAL COURSE [is not hard coded in the student information management system (SIMS).]

Students who have taken (*place relevant course(s) in the blank below (ex: STAT 100)*) **first** may not then take this course for further credit.

2. ONE-WAY EQUIVALENCY [is not hard coded in SIMS.]

(*Place relevant course(s) in the blank below (ex: STAT 100)*) will be accepted in lieu of this course.

3. TWO-WAY EQUIVALENCY [is hard coded and enforced by SIMS.]

Students with credit for (*place relevant course(s) in the blank below (ex: STAT 100)*) may not take this course for further credit.

Does the partner academic unit agree that this is a two-way equivalency? ☐ YES ☐ NO
Please also have the partner academic unit submit a course change form to update the course equivalency for their course(s).

4. SPECIAL TOPICS PRECLUSION STATEMENT [is not hard coded in SIMS.]

FEES

Are there any proposed student fees associated with this course other than tuition fees? ☐ YES ☐ NO

COURSE – LEVEL EDUCATIONAL GOALS (OPTIONAL)

RESOURCES

List any outstanding resource issues to be addressed prior to implementation: space, laboratory equipment, etc:

N/A

OTHER IMPLICATIONS

Final exam required ☑ YES ☐ NO

Criminal Record Check required ☐ YES ☑ NO

OVERLAP CHECK

Checking for overlap is the responsiblity of the Associate Dean.

Each new course proposal must have confirmation of an overlap check completed prior to submission to the Faculty Curriculum Committee.

Name of Originator

Helen Bailey

SFU

COURSE SUBJECT MSE   **NUMBER** 413

COURSE TITLE LONG — for Calendar/schedule, no more than 100 characters including spaces and punctuation

Machine Learning in Mechatronics

COURSE TITLE SHORT — for enrollment/transcript, no more than 30 characters including spaces and punctuation

Machine Learning Mechatronics

CAMPUS where course will be normally taught: ☐ Burnaby ☑ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

COURSE DESCRIPTION — 50 words max. Attach a course outline. Don't include WQB or prerequisites info in this description box.

An introduction to machine learning (ML) packages in Python. An introduction to the development and implementation of ML algorithms in mechatronic systems (MS). It covers a wide variety of ML techniques including supervised, unsupervised and reinforcement learning algorithms. Students learn to develop and implement ML algorithms in embedded systems, also how to evaluate developed models.

REPEAT FOR CREDIT ☐ YES ☑ NO Total completions allowed [   ] Within a term? ☐ YES ☐ NO

LIBRARY RESOURCES

NOTE: Senate has approved (S.93-11) that no new course should be approved by Senate until funding has been committed for necessary library materials. Each new course proposal must be accompanied by the email that serves as proof of assessment. For more information, please visit www.lib.sfu.ca/about/overview/collections/course-assessments.

RATIONALE FOR INTRODUCTION OF THIS COURSE

Today most of the advanced mechatronic systems are highly complex and categorized into interdisciplinary studies. These systems are usually without a mathematical model to describe their dynamics behaviors. Additionally, in Industry 4.0 (smart manufacturing) machines needs to collaborate with each other and enhance interaction with environment to improve make decisions without human involvement. Analysis and development of these systems are difficult tasks. Machine learning (ML) algorithms can be used to mimic and predict the behavior and dynamics of a complex system. These methods reliably produce and repeat results based on iterative learning approach using acquired empirical data. With the promising advancements in computation technologies, ML techniques can be implemented in Micro-controller platforms and have drawn a great deal of attention among hi-tech companies and universities researchers.

On the other hand, interdisciplinary research fields and Smart Manufacturing are among active areas in the School of Mechatronic Systems Engineering (MSE). Undergraduate and graduate students who work on the development of these systems require learning ML techniques. Before offering this course, MSE students take the pertinent course (CMPT419/726: Machine Learning) from the School of Computing Science in Burnaby Campus. Although this course has had a solid and well-defined materials, it has been designed for Computing Science's students, that is students need to spend a majority of their time for the development of the core of ML techniques and algorithms, say, developing cost function to make algorithms much faster or more effective. However, MSE students mostly need to learn how to choose and develop these algorithms in their projects with less emphasize on algorithm development. Implementation of ML algorithms on embedded mechatronic systems is another area that this new course emphasizes on that. Therefore, this new course aims to introduce to MSE students the application of machine learning techniques in mechatronic systems.

SCHEDULING AND ENROLLMENT INFORMATION

Effective term and year (e.g. FALL 2016) | Summer 2023

Term in which course will typically be offered ☑ Spring ☐ Summer ☐ Fall

Other *(describe)*

Will this be a required or elective course in the curriculum? ☐ Required ☑ Elective

What is the probable enrollment when offered? Estimate: 60

UNITS
Indicate number of units: 3

Indicate no. of contact hours: 3/w Lecture ☐ Seminar ☐ Tutorial 3/w Lab ☐ Other; explain below

OTHER

FACULTY

Which of your present CFL faculty have the expertise to offer this course?

Mohammad Narimani

WQB DESIGNATION

(attach approval from Curriculum Office)

PREREQUISITE AND / OR COREQUISITE

Minimum 80 credits, Digital Logic and Micro-controllers (MSE 352)

EQUIVALENT COURSES [For more information on equivalency, see Equivalency Statements under Information about Specific Course components.]

1. SEQUENTIAL COURSE [is not hard coded in the student information management system (SIMS).]

Students who have taken (*place relevant course(s) in the blank below (ex: STAT 100)*) **first** may not then take this course for further credit.

> Students who have taken CMPT 726 first may not then take this course for further credit.

2. ONE-WAY EQUIVALENCY [is not hard coded in SIMS.]

(*Place relevant course(s) in the blank below (ex: STAT 100)*) will be accepted in lieu of this course.

3. TWO-WAY EQUIVALENCY [is hard coded and enforced by SIMS.]

Students with credit for (*place relevant course(s) in the blank below (ex: STAT 100)*) may not take this course for further credit.

Does the partner academic unit agree that this is a two-way equivalency?   ☐ YES   ☐ NO
Please also have the partner academic unit submit a course change form to update the course equivalency for their course(s).

4. SPECIAL TOPICS PRECLUSION STATEMENT [is not hard coded in SIMS.]

> Students with credit for CMPT 419 under the title "Machine Learning" may not then take this course for further credit.

FEES

Are there any proposed student fees associated with this course other than tuition fees?   ☐ YES   ☑ NO

COURSE – LEVEL EDUCATIONAL GOALS (OPTIONAL)

RESOURCES

List any outstanding resource issues to be addressed prior to implementation: space, laboratory equipment, etc:

NA

OTHER IMPLICATIONS

Final exam required ☐ YES ☑ NO

Criminal Record Check required ☐ YES ☑ NO

OVERLAP CHECK

Checking for overlap is the responsiblity of the Associate Dean.

Each new course proposal must have confirmation of an overlap check completed prior to submission to the Faculty Curriculum Committee.

Name of Originator

Dr. Mohammad Narimani

COURSE SUBJECT MSE **NUMBER** 460

COURSE TITLE LONG — for Calendar/schedule, no more than 100 characters including spaces and punctuation

Precision AgriTech Engineering

COURSE TITLE SHORT — for enrollment/transcript, no more than 30 characters including spaces and punctuation

Precision AgriTech Eng

CAMPUS where course will be normally taught: ☐ Burnaby ☑ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

COURSE DESCRIPTION — 50 words max. Attach a course outline. Don't include WQB or prerequisites info in this description box.

Digital agricultural mapping and technologies. Guidance and path sensing for agriculture including autonomous technologies, drones and AUVs. Sensing technologies including optical, gas, temperatures sensors for aerial and remote sensing of the environment and agricultural products, in natural and controlled settings. Data gathering and management, analysis of sensor data, including the application of variable rate systems.

REPEAT FOR CREDIT ☐ YES ☑ NO Total completions allowed [ ] Within a term? ☐ YES ☑ NO

LIBRARY RESOURCES
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RATIONALE FOR INTRODUCTION OF THIS COURSE

The proposed new AgriTech Concentration within MSE is based on building expertise and HQP to further the technology-based innovation within the Agricultural industry which is especially pertinent for BC. This Course will allow students to understand some of the mapping, sensing and data management needs to advance innovation in this area.

SCHEDULING AND ENROLLMENT INFORMATION

Effective term and year (e.g. FALL 2016) | Summer 2023

Term in which course will typically be offered   ☑ Spring   ☐ Summer   ☐ Fall

Other *(describe)*

Will this be a required or elective course in the curriculum?   ☑ Required   ☐ Elective

What is the probable enrollment when offered?   Estimate: | 30

UNITS

Indicate number of units: | 3

Indicate no. of contact hours: | 3 | Lecture | | Seminar | | Tutorial | 3 | Lab | | Other; explain below

OTHER

FACULTY

Which of your present CFL faculty have the expertise to offer this course?

New faculty will be hired to teach this Course

WQB DESIGNATION

(attach approval from Curriculum Office)

PREREQUISITE AND / OR COREQUISITE

MSE 310 (pre-req)
MSE 360 (pre-req)

EQUIVALENT COURSES [For more information on equivalency, see Equivalency Statements under Information about Specific Course components.]

1. SEQUENTIAL COURSE [is not hard coded in the student information management system (SIMS).]

Students who have taken (*place relevant course(s) in the blank below (ex: STAT 100)*) **first** may not then take this course for further credit.

2. ONE-WAY EQUIVALENCY [is not hard coded in SIMS.]

(*Place relevant course(s) in the blank below (ex: STAT 100)*) will be accepted in lieu of this course.

3. TWO-WAY EQUIVALENCY [is hard coded and enforced by SIMS.]

Students with credit for (*place relevant course(s) in the blank below (ex: STAT 100)*) may not take this course for further credit.

Does the partner academic unit agree that this is a two-way equivalency? ☐ YES ☐ NO
Please also have the partner academic unit submit a course change form to update the course equivalency for their course(s).

4. SPECIAL TOPICS PRECLUSION STATEMENT [is not hard coded in SIMS.]

FEES

Are there any proposed student fees associated with this course other than tuition fees? ☐ YES ☑ NO

COURSE – LEVEL EDUCATIONAL GOALS (OPTIONAL)

RESOURCES

List any outstanding resource issues to be addressed prior to implementation: space, laboratory equipment, etc:

N/A

OTHER IMPLICATIONS

Final exam required   ☑ YES   ☐ NO

Criminal Record Check required   ☐ YES   ☑ NO

OVERLAP CHECK

Checking for overlap is the responsiblity of the Associate Dean.

Each new course proposal must have confirmation of an overlap check completed prior to submission to the Faculty Curriculum Committee.

Name of Originator

Helen Bailey