S.24-144

SFU GRADUATE STUDIES

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**MEMORANDUM**

ATTENTION Senate

DATE September 10, 2024

FROM Mary O'Brien,
Chair of Senate Graduate Studies Committee (SGSC)

RE: New Courses

**For information:**
Acting under delegated authority at its meeting of September 10, 2024, SGSC approved the following new courses, effective **Summer 2025**:

**Faculty of Applied Science**

~~School of Mechatronic Systems Engineering~~

~~1) New Course: MSE 713 Machine Learning in Mechatronics~~

School of Sustainable Energy Engineering

2) New Course: SEE 795 Sustainable Energy Engineering Industrial Internship
3) New Course: SEE 830 Energy Modelling to Support the SDGs
4) New Course: SEE 870 Sustainable Vehicle Propulsion Technologies (Fall 2025)

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
OFFICE OF THE DEAN
Faculty of Applied Sciences
Simon Fraser University

MEMORANDUM

| | | |
|---|---|---|
| Attention | Dr. Mary O'Brien<br>Dean, Graduate Studies | July 2, 2024, |
| From | Dr. Parvaneh Saeedi, psaeedi@sfu.ca<br>Faculty of Applied Science, Graduate Studies Committee | |

Re: FAS - ~~MSE and~~ SEE New Graduate Courses

The Faculty of Applied Sciences Graduate Studies Committee would request creating the following a new courses:

1. ~~**MSE 713 - Machine Learning in Mechatronics - effective Summer 2025**~~
   ~~The justification for introducing this new course lies in the fact that the skills acquired through it are in high demand within both the industry and our research programs. Dr. Mohammad Narimani has successfully delivered this course twice as a special topic offering, receiving positive feedback from graduate students. Additionally, students pursuing the MSE Masters in Smart Manufacturing have expressed interest in this course. The course differs from graduate machine learning courses in computing science through its focus on applications of machine learning methods to problems in mechatronics.~~

2. **SEE 795 - Industrial Internship - effective Summer 2025**
   The introduction of the industrial internship course allows SEE graduate students to take full-time positions with industrial partners as interns for one term while remaining enrolled at SFU. Graduate students are seeking opportunities to participate in industrial internships while maintain their status as graduate students. SEE 795 will address this need.

3. **SEE 830 - Energy Modelling for SDGs - effective Summer 2025**
   We request to have the conversion of the special topic course, Energy Modelling for SDGs into a regular course, SEE 830. It has been successfully offered three times in the past.

4. **SEE 870 - Sustainable Vehicle Propulsion Technologies - effective Fall 2025**
   We request to have the conversion of the special topic course, Sustainable Vehicle Propulsion Technologies into a regular course, SEE 870. It has been successfully offered three times in the past.

Best Regards,

Parvaneh Saeedi,
Faculty of Applied Science, Graduate Studies Committee

SFU FACULTY OF APPLIED SCIENCES | SUSTAINABLE ENERGY ENGINEERING

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Surrey, BC, Canada V5A 1S6

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fas_sry_admin@sfu.ca
www.sfu.ca/see

**MEMORANDUM**

| | | | |
|---|---|---|---|
| **ATTENTION** | Associate Dean Research and Grad Studies, Faculty of Applied Sciences | **DATE** | June 21st, 2024 |
| **FROM** | Dr. Vahid Hosseini, Graduate Program Chair, School of Sustainable Energy Engineering | **PAGES** | 1 |
| **RE:** | Addition of New Courses to SEE Graduate Program Changes | | |

This memo is to request approval of three new SEE courses.

The introduction of the new industrial internship course (SEE 795) will allow SEE graduate students to take full time positions in industrial partners as an intern for one term while enrolling at SFU.

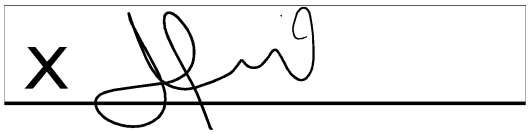
Secondly, the regularization of the energy modelling for SDGs course (SEE 830) is requested as it has been offered successfully 3 times in the past as the special topic course.

Lastly, the regularization of the sustainable vehicle propulsion technologies course,(SEE 870) is requested as it has also been offered successfully 3 times in the past as a special topic course

This is anticipated to appear in the SEE calendar for Summer 2025 and Fall 2025.

The rationale for these changes is that graduate students are asking for participation in industrial internship while they keep their status as a graduate student.
The special topic regularization at SEE happens after 3 successful offering the course, followed by approval of GPC and school council.

Regards

X 

Vahid Hosseini
SEE Graduate Program Chair

SFU GRADUATE AND POSTDOCTORAL STUDIES

# New Graduate Course Proposal

| Course Subject (eg. PSYC) | Number (eg. 810) | Units (eg. 4) |
|---|---|---|
| SEE | 795 | 3 |

Course title (max. 100 characters)

**Sustainable Energy Engineering Industrial Internship**

Short title (for enrollment/transcript - max. 30 characters) **Industrial Internship**

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description - max. 50 words)

Full time working internship (excluding Mitacs) in industry or a research environment for SEE graduate research students. A final report will be submitted and graded by the student's supervisor. Graded on a satisfactory/unsatisfactory basis.

Rationale for introduction of this course

Students are interested in taking internships and at this point there is no formal process for allowing this in SEE.

| Term of initial offering (eg. Fall 2019) | Course delivery (eg. 3 hrs/week for 13 weeks) |
|---|---|
| Summer 2025 | 560 hours |
| **Frequency of offerings/year** | **Estimated enrollment per offering** |
| Offered every term. | 1-2 students per term |

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)

Prerequisite and/or Corequisite

Completion of all required coursework towards the students' degree and satisfactory academic standing. Approval of supervisor and a GPC representative is required prior to accepting an internship

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite

Additional course fees? ☐ Yes ☑ No

Campus where course will be taught ☐ Burnaby ☐ Surrey ☐ Vancouver ☐ Great Northern Way ☑ Off campus

Course Components * ☐ Lecture ☐ Seminar ☐ Lab ☐ Independent ☐ Capstone ☑ Internship

Grading Basis ☐ Letter grades ☑ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

| | | |
|---|---|---|
| Repeat for credit? ☑ Yes ☐ No | Total repeats allowed? 3 | Repeat within a term? ☐ Yes ☑ No |
| Required course? ☐ Yes ☑ No | Final exam required? ☐ Yes ☑ No | Capstone course? ☐ Yes ☑ No |

Combined with a undergrad course? ☐ Yes ☑ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

* See important definitions on the curriculum website.

## RESOURCES

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

| Faculty member(s) who will normally teach this course |
|---|
| Students' graduate supervisor. |
| Additional faculty members, space, and/or specialized equipment required in order to offer this course |
| N/A |

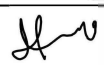
## CONTACT PERSON

| Academic Unit / Program | Name (typically, Graduate Program Chair) | Email |
|---|---|---|
| SEE | Vahid Hosseini | Vahid_Hosseini@sfu.ca |

## ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

| | | |
|---|---|---|
| Graduate Program Committee<br>Vahid Hosseini | Signature  | Date<br>2024-06-06 |
| Department Chair<br>Zafar Adeel | Signature  | Date<br>2024-06-14 |

## FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

Overlap check done? ☑ YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

| Faculty Graduate Studies Committee | Signature | Date |
|---|---|---|
| Parvaneh Saeedi |  | July 2, 2024 |

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

## SENATE GRADUATE STUDIES COMMITTEE APPROVAL

| Senate Graduate Studies Committee | Signature | Date |
|---|---|---|
| Mary O'Brien |  | September 10, 2024 |

ADMINISTRATIVE SECTION (for DGS office only)

Library Check: _____
Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: _____
Financial Aid Progress Units: _____

# SEE 795- Industrial Internship
# Course Outline

**Overview**

Course Times + Location: TBA

**Prerequisites**

Completion of all required coursework towards the students' degree. Approval of supervisor and a GPC representative is required prior to accepting an internship.

**Calendar Description**

Full time working internship (excluding Mitacs) in industry or a research environment for SEE graduate research students. A final report will be submitted and graded by the student's supervisor. Graded on a satisfactory/unsatisfactory basis. Prerequisite: Completion of all required coursework towards the students' degree and satisfactory academic standing. Approval of supervisor and GPC chair is required prior to accepting an internship.

SFU GRADUATE AND POSTDOCTORAL STUDIES

# New Graduate Course Proposal

| Course Subject (eg. PSYC) SEE | Number (eg. 810) 830 | Units (eg. 4) 3 |
|---|---|---|

Course title (max. 100 characters)

**Energy Modelling to Support the SDGs**

Short title (for enrollment/transcript - max. 30 characters) **Modelling to Support the SDGs**

Course description for SFU Calendar (course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description - max. 50 words)

Energy and systems modelling to support sustainable development and the United Nations Sustainable Development Goals (SDGs). Specific topics include types of models, their advantages and disadvantages, optimization modelling, modelling of the nexus of climate, land energy and water systems and the interpretation of model results to inform policy. Students will complete a modelling project intended to help them investigate the policy implications of their research.

Rationale for introduction of this course

This course has been offered as SEE 893: Special Topics three years in a row. As this is expected to be an ongoing offering it makes sense to create a specific course for the topic.

| Term of initial offering (eg. Fall 2019) Summer 2025 | Course delivery (eg. 3 hrs/week for 13 weeks) 2 hrs/wk synchronous and 1 hr/wk asynchronous for 13 weeks. |
|---|---|
| Frequency of offerings/year 1 | Estimated enrollment per offering 10 |

Equivalent courses (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)
Students with credit for SEE 893 under the title "Modelling to Support the SDGs" may not take this course for further credit.

Prere isite and/or Corequisite

Criminal record check required? ☐ Yes if yes is selected, add this as prerequisite

Additional course fees? ☐ Yes ☑ No

Campus where course will be taught ☐ Burnaby ☑ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

Course Components * ☑ Lecture ☐ Seminar ☐ Lab Independent ☐ Capstone ☐ _____

Grading Basis ☑ Letter grades ☐ Satisfactory/ Unsatisfactory ☐ In Progress / Complete

| Repeat for credit? ☐ Yes ☑ No | Total repeats allowed? _____ | Repeat within a term? ☐ Yes ☑ No |
|---|---|---|
| Required course? ☐ Yes ☑ No | Final exam required? ☐ Yes ☑ No | Capstone course? ☐ Yes ☑ No |

Combined with a undergrad course? ☐ Yes ☑ No If yes, identify which undergraduate course and the additional course requirements for graduate students:

* See important definitions on the curriculum website.

## RESOURCES

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

| Faculty member(s) who will normally teach this course |
|---|
| Taco Niet |
| **Additional faculty members, space, and/or specialized equipment required in order to offer this course** |
| N/A |

## CONTACT PERSON

| Academic Unit / Program | Name (typically, Graduate Program Chair) | Email |
|---|---|---|
| SEE | Vahid Hosseini | v_hosseini@sfu.ca |

## ACADEMIC UNIT APPROVAL

A course outline must be included.

Non-departmentalized faculties need not sign

| | | |
|---|---|---|
| Graduate Program Committee<br>Vahid Hosseini | Signature | Date<br>2024-06-06 |
| Department Chair<br>Zafar Adeel | Signature | Date<br>2024-06-14 |

## FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

Overlap check done? [X] YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

| Faculty Graduate Studies Committee | Signature | Date |
|---|---|---|
| Parvaneh Saeedi | | July 2, 2024 |

A library review will be conducted. If additional funds are necessary, DGS will contact the academic unit prior to SGSC.

## SENATE GRADUATE STUDIES COMMITTEE APPROVAL

| Senate Graduate Studies Committee | Signature | Date |
|---|---|---|
| Mary O'Brien | | September 10, 2024 |

ADMINISTRATIVE SECTION (for DGS office only)

Library Check: _____

Course Attribute: _____

Course Attribute Value: _____

Instruction Mode: _____

Attendance Type: _____

If different from regular units:

Academic Progress Units: _____

Financial Aid Progress Units: _____

# SEE 830- Energy Modelling to Support the SDGs

**Instructor: Taco Niet**

**Calendar Description**

Energy and systems modelling to support sustainable development and the United Nations Sustainable Development Goals (SDGs). Specific topics include types of models, their advantages and disadvantages, optimization modelling, modelling of the nexus of climate, land energy and water systems and the interpretation of model results to inform policy. Students will complete a modelling project intended to help them investigate the policy implications of their research.

**Learning Outcomes**

By the end of this course you will be able to:

1. Explain the structure and applicability of various energy/economy models.
2. Use energy systems models to inform policy suggestions.
3. Critique published works that utilize energy systems models.
4. Justify the use of a given energy system model structure for a given systems analysis.
5. Explain the simplex method for solving linear programming problems.
6. Communicate your research results.

**Evaluation and Grading**

Your grade will be based on the following components. The due dates and other details for each component, will be posted to Canvas.

| | |
|---|---|
| 15% | Presentation on a model type |
| 15% | Finishing one online modelling course |
| 10% | Submission of questions for midterm |
| 15% | Midterm |
| 30% | Project Report |
| 15% | Project Presentation |

SFU GRADUATE STUDIES

# NEW GRADUATE COURSE PROPOSAL

| **Course Subject** (eg. PSYC) SEE | **Number** (eg. 810) 870 | **Units** (eg. 4) 3 |
|---|---|---|

**Course title** (max. 100 characters): Sustainable Vehicle Propulsion Technologies

**Short title** (for enrollment/transcript - max 30 characters): Vehicle Propulsion Tech.

**Course description for SFU Calendar** *(course descriptions should be brief and should never begin with phrases such as "This course will..." or "The purpose of this course is..." If the grading basis is satisfactory/unsatisfactory include this in the description. Max. 50 words)

Evaluating vehicle propulsion systems with a focus on on-road applications. Definition, modelling and assessment of system level performance. Consideration of energy use, greenhouse gas emissions and environmental impacts of different technologies. Impacts of regulatory, economic and societal barriers and attactors.

**Rationale for introduction of this course**

Course has been offered three times as a special topics course (SEE894) in Fall 2021, 2022, and 2023. Enrollment was 7, 6, and 10 respectively, out of a total SEE graduate student population of between 20 and 50 students in this time. Enrollment was typically 20% from outside of SEE.

| | |
|---|---|
| **Term of initial offering** (eg. Fall 2019) Fall 2025 | **Course delivery** (eg 3 hrs/week for 13 weeks) 3 hrs/week lecture+ 1 hr/week tutorials for 13 weeks |
| **Frequency of offerings/year** 1 | **Estimated enrollment per offering** 10-15 |

**Equivalent courses** (courses that replicates the content of this course to such an extent that students should not receive credit for both courses)

Students with credit for SEE 894 under "Vehicle Powertrain Systems" or "Sustainable Vehicle Systems" may not take this course for further credit.

**Prerequisite and/or Corequisite**

None

**Criminal record check required?** ☐ Yes (if yes is selected, add this as prerequisite) **Additional course fees?** ☐ Yes ☑ No

**Campus where course will be taught** ☐ Burnaby ☑ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

**Course Components*** ☑ Lecture ☐ Seminar ☐ Lab ☐ Research ☐ Practicum ☐ Online ☒ Other: Tutorial

**Grading Basis** ☑ Letter grades ☐ Satisfactory or Unsatisfactory ☐ In Progress/Complete

| | | |
|---|---|---|
| **Repeat for credit?** ☐ Yes ☑ No | **Total repeats allowed?** _____ | **Capstone course?** ☐ Yes ☑ No |
| **Required course?** ☐ Yes ☑ No | **Final exam required?** ☐ Yes ☑ No | **Repeat within a term?** ☐ Yes ☑ No |

**Combined with an undergrad course?** Yes ☑ No If yes, identify which undergraduate course and what the additional course requirement are for graduate students:

* See important definitions on the curriculum website.

## RESOURCES

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

| **Faculty member(s) who will normally teach this course** |
|---|
| Gordon McTaggart-Cowan |
| **Additional faculty members, space, and/or specialized equipment required in order to offer this course** |
| Computer lab. |

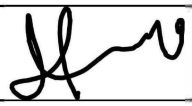
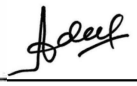
## CONTACT PERSON

| **Academic Unit / Program** | **Name (typically, Graduate Program Chair)** | **Email** |
|---|---|---|
| Sustainable Energy Engineering, MASc/MEng/PhD | Vahid Hosseini | |

## ACADEMIC UNIT APPROVAL

☑ A course outline / syllabus is included

Non-departmentalized faculties need not sign

| | | |
|---|---|---|
| **Department Graduate Program Committee** Vahid Hosseini | **Signature**  | **Date** June 27, 2024 |
| **Department Chair** Zafar Adeel | **Signature**  | **Date** 27 June 2024 |

## FACULTY APPROVAL

The course form and outline must be sent by FGSC to the chairs of each FGSC (fgsc-list@sfu.ca) to check for an overlap in content

overlap check done? ☑ YES

This approval indicates that all the necessary course content and overlap concerns have been resolved. The Faculty/Academic Unit commits to providing the necessary resources.

| | | |
|---|---|---|
| **Faculty Graduate Studies Committee (FGSC)** Parvaneh Saeedi | **Signature**  | **Date** July 10, 2024 |

A library review will be conducted. If additional funds are necessary, Graduate Studies will contact the academic unit prior to SGSC.

## SENATE GRADUATE STUDIES COMMITTEE APPROVAL

| | | |
|---|---|---|
| **Senate Graduate Studies Committee (SGSC)** Mary O'Brien | **Signature**  | **Date** September 10, 2024 |

**ADMINISTRATIVE SECTION (for Graduate Studies office only)**

Course Attribute: _____
Course Attribute Value: _____
Instruction Mode: _____
Attendance Type: _____

If different from regular units:
Academic Progress Units: _____
Financial Aid Progress Units: _____

**Course Outline**
**SEE870 – Sustainable Vehicle Propulsion Technologies**

**Course overview:**
The course is focused on understanding current and near-future vehicle motive power and powertrain technologies. The content will include consideration of the choices of fuel/energy source on net life-cycle emissions through well-to-wheel analysis. The factors Influencing vehicle technology development in different jurisdictions and market segments will be considered. Vehicle-system level considerations will include interactions between the vehicle demands, energy conversion and storage technologies. The course will be project-centered and will involve significant self-directed learning components.

**Calendar Description:**
Evaluating vehicle propulsion systems with a focus on on-road applications. Definition, modelling and assessment of system level performance. Consideration of energy use, greenhouse gas emissions and environmental impacts of different technologies. Iimpacts of regulatory, economic and societal barriers and attactors.

**Course intended learning outcomes:**
At the end of the course, a learner should be able to:

- explain the diversity of transportation services used by modern society, describe how these services are provided, and quantify the energy system and environmental impacts of current technologies that deliver these services;
- describe existing regulatory frameworks and assess whether these have been successful in driving the development and implementation of more sustainable transportation technologies;
- conduct a well-to-wheel analysis using industry-standard software tools for a defined vehicle application and energy carrier;
- develop a model of a vehicle system and use the model to assess the performance requirements for individual components for a specified drive cycle applied to a defined powertrain configuration;
- evaluate the suitability of vehicle powertrain systems and energy conversion technologies for specific vehicle applications, considering regulatory and economic barriers and attractors;
- predict the impacts of future regulation on technology directions for different service provisions within the transportation sector; and
- assess how technology developments can lead to reduced environmental impacts from transportation services.

**Assessment strategy:**

- 25% - Assignments (3, approx. monthly: quantitative and qualitative questions based on course content)
- 15% - in-class technical lecture (30-45 min lecture on a topic relevant to the course)
- 60% - project, including:
    - 5% - detailed proposal
    - 15% - presentation (15-20 minutes, conference style)
    - 40% - final report

**Overall course structure:**

1. **Transportation, Pollution & Regulations:** The development of on-road vehicle technologies; environmental impacts; regulatory requirements and well-to-wheel analysis
2. **Vehicle Dynamics & Duty Cycles:** Vehicle dynamics, duty cycles (use cases for passenger cars, trucks, etc); forces acting on a vehicle; how to calculate motive power requirements.
3. **Powertrain components and systems:** Identify the components of the powertrain systems for different vehicle configurations, uses, and energy storage systems; performance of key system components; importance of control strategies; implications for vehicle design and use.
4. **Energy storage & conversion:** Requirements and challenges of on-vehicle energy storage; energy conversion devices (ICEs, fuel cells); component and system efficiencies and torque-speed maps. Transient vs. steady-state performance.
5. **The future of transportation:** How will demand change in the future? What technology pathways are we on, and how are regulatory considerations driving technology vs. outcomes? What disruptive technologies may be on the horizon?