



8888 University Drive,
Burnaby, BC
Canada V5A 1S6

TEL: 778.782.4636
FAX: 778.782.5876

avpcio@sfu.ca
www.sfu.ca/vpacademic

MEMORANDUM

ATTENTION Senate DATE May 6, 2011
FROM Bill Krane, Chair PAGES 1
Senate Committee on Undergraduate
Studies
RE: Faculty of Applied Science (SCUS 11-29)

For information:

Acting under delegated authority at its meeting of May 5, 2011, SCUS approved the following curriculum revisions effective Spring 2012:

1. School of Engineering Science (SCUS 11-29b)

(a) Prerequisite and description changes for ENSC 311 (effective Summer 2012) and 312

(b) New Course Proposals:

ENSC 430-3, Advanced Electronic Circuits
ENSC 432-3, Manufacturing Systems
ENSC 436-3, Advanced Vibration

Senators wishing to consult a more detailed report of curriculum revisions may do so on the Web at http://www.sfu.ca/senate/Senate_agenda.html following the posting of the agenda. If you are unable to access the information, please call 778-782-3168 or email shelley_gair@sfu.ca.



SENATE COMMITTEE ON UNDERGRADUATE STUDIES

COURSE CHANGE/DELETION

Existing Course, Changes Recommended

Please check appropriate revision(s):

- Course number
- Credit
- Title
- Description
- Prerequisite
- Course deletion

Indicate number of hours for: Lecture 3 Seminar 11 Tutorial _____ Lab _____

FROM _____ to _____
 Course Number ENSC 311-3 Course Number _____
 Credits (Units) 3 Credits (Units) _____

TITLE

(1) Long title for calendar and schedule, no more than 100 characters including spaces and punctuation.

The Business of Engineering I

(2) Short title for enrollment and transcript, no more than 30 characters including spaces and punctuation.

The Business of Engineering I

DESCRIPTION

Provides fundamentals of the business, management and entrepreneurial concepts important to Canadian engineers who manage projects, run businesses, or need to decide on the most efficient method for accomplishing a task. Topics include the Canadian ...

DESCRIPTION

Covers topics in decision theory and engineering economics including: gap analysis, Multi-attribute utility theory, Discounted cash flow fundamentals, Inflation, depreciation, tax, Financial analysis, Uncertainty, and Optimization.

PREREQUISITE

More than 50 units

PREREQUISITE

MORE THAN 50 UNITS

Rationale

Calendar description has changed after the course development was finalized for its first offering in Summer 2010.

Does this course replicate the content of a previously approved course to such an extent that students should not receive credit for both courses? If so, this should be **noted in the prerequisite.**

12'14 (Summer 2012)

Effective term and year _____



EXISTING COURSE, CHANGES RECOMMENDED

Please check appropriate revision(s):

Course number Credit Title Description Prerequisite Course deletion

Indicate number of hours for: Lecture 3 Seminar 11 Tutorial _____ Lab _____

FROM		TO	
Course Number	<u>ENSC 312</u>	Course Number	<u>ENSC 312</u>
Credits (Units)	<u>3</u>	Credits (Units)	<u>3</u>

TITLE

(1) Long title for calendar and schedule, no more than 100 characters including spaces and punctuation.

The Business of Engineering II: Applications and Commercialization

(2) Short title for enrollment and transcript, no more than 30 characters including spaces and punctuation.

The Business of Engineering II

DESCRIPTION

Offered in conjunction with ENSC 384 Mechatronics Design II. Concepts covered include project management skills such as budgeting, scheduling earned value analysis as well as facilitation, communication and negotiation. Students will experience what it is like to be part of a diverse project team ...

PREREQUISITE

Prerequisites: ENSC 311, Corequisite: ENSC 384

DESCRIPTION

Concepts covered include entrepreneurship, marketing, financing, business plan, project management skills as well as facilitation, communication and negotiation. Students will experience what it is like to be part of a start-up company with a diverse project team.

PREREQUISITE

Prerequisite: ENSC 311

RATIONALE

The course was moved to the fourth year, and adjustments were made in the co requisites

Does this course replicate the content of a previously approved course to such an extent that students should not receive credit for both courses? If so, this should be **noted in the prerequisite**.

Effective term and year Spring 2011



COURSE NUMBER ENSC 430 - 3

COURSE TITLE

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

Advanced Electronic Circuits

AND

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

AdvancedElectronicCircuits

CREDITS

Indicate number of credits for: Lecture 3 Seminar 0 Tutorial 1 Lab 1

COURSE DECIPTION (FOR CALENDAR). 3-4 LINES MAXIMUM. ATTACH A COURSE OUTLINE TO THIS PROPOSAL.

~~This course is an~~ Introduction to advanced topics in electronic circuit design. The emphasis is put on circuits and devices which are needed by mechatronics engineers in practice.

PREREQUISITE

ENSC 226. Students with credit for ENSC 325 cannot take this course for further credit.

COREQUISITE

None

SPECIAL INSTRUCTIONS

That is, does this course replicate the content of a previously-approved course to such an extent that students should not receive credit for both courses.? If so, this should be noted in the prerequisite.

COURSE(S) TO BE DELETED IF THIS COURSE IF APPROVED. NOTE: APPROPRIATE DOCUMENT FOR DELETION MUST BE SUBMITTED TO SCUS.

RATIONALE FOR INTRODUCTION OF THIS COURSE.

The students in the Mechatronics Systems Engineering program learn about electronic circuit design in only one course in the program. This course is set up to familiarise the students in Mechatronics program with more advanced topics in electronic circuit design.



**SCHEDULING AND ENROLLMENT
INFORMATION**

Indicate effective term and year course would first be offered and planned frequency of offering thereafter:
Offered once per year – currently planned for summer 2012 as first offering

(NOTE: There is a two-term wait for implementation of any new course.)

Indicate if there is a waiver required: YES NO Will this be a required or elective course in the curriculum? Required Elective

What is the probable enrollment when offered? Estimate 0

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

Dr B. Bahreyni, Dr M. Moallem, Dr A. Rad

Are there any proposed student fees associated with this course other than tuition fees? YES NO
(If yes, attach mandatory supplementary fee approval form.)

RESOURCE IMPLICATIONS

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 a library report and, if appropriate, confirmation that funding arrangements have been addressed.

Campus where course will be taught Surrey

Library report status Relevant books and supplies are available in Surrey library

Provide details on how existing instructional resources will be redistributed to accommodate this new course. For example, will another course be eliminated or will the frequency of offering of other courses be reduced; are there changes in pedagogical style or class sizes that allow for this additional course offering?

This course will use the facilities in the Electronics Laboratory at Surrey.

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

None

Articulation agreement reviewed? YES NO Not applicable

OTHER IMPLICATIONS

Students who have taken ENSC 325 may not take this course for further credit.3



APPROVALS

- 1 Departmental approval indicates that the Department or School has approved the content of the course, and has consulted with other Departments/Schools/Faculties regarding proposed course content and overlap issues.

Glenn Chapman Apr. 21, 2011
 Chair, Department/School Date

[Signature] Apr. 21, 2011
 Chair, Faculty Curriculum Committee Date

- 2 Faculty approval indicates that all the necessary course content and overlap concerns have been resolved, and that the Faculty/School/Department commits to providing the required Library funds.

[Signature] Apr. 21, 2011
 Dean or designate Date

LIST which other Departments, Schools and Faculties have been consulted regarding the proposed course content, including overlap issues. Attach documentary evidence of responses.

There is some overlap between the proposed course and ENSC-325 (<http://www.ensc.sfu.ca/courses/course-list/325>). The main difference is that the emphasise in 325 is on integrated circuit techniques, but this course will be geared towards discrete design techniques which will probably be more useful to mechatronics students. Students who have taken ENSC 325 need not take this course.

SCI. / PHYSICS.

Other Faculties approval indicated that the Dean(s) or Designate of other Faculties AFFECTED by the proposed new course support(s) the approval of the new course:

[Signature] _____ Date _____

_____ Date _____

- 3 SCUS approval indicates that the course has been approved for implementation subject, where appropriate, to financial issues being addressed.

COURSE APPROVED BY SCUS (Chair of SCUS):

_____ Date _____

APPROVAL IS SIGNIFIED BY DATE AND APPROPRIATE SIGNATURE.

NEW COURSE PROPOSAL:

Advanced Electronic Circuits

Prepared by: B. Bahreyni, Assistant Professor
Mechatronic Systems Engineering School of Engineering Science

Date:
Mar 31, 2010

Course Number
ENSC 430

Course Title (long)
Advanced Electronic Circuits

Course Title (short)
Advanced Electronic Circuits

Course Description
This course is an introduction to advanced topics in electronic circuit design. The emphasis is put on circuits and devices which are needed by mechatronics engineers in practice.

Weekly Hours
Lect 3; Sem 0; Tut 1; Lab 1

Keywords
Transistor, MOSFET, Amplifiers, Differential amplifiers, Frequency response, Feedback and stability, Passive filters, Active filters, Noise, IC design.

Prerequisite
ENSC 226. Students with credit for ENSC 325 may not take this course for further credit.

Co-requisite
None

Special Instructions
Students with credit for ENSC 325 may not take this course for further credit.

Course(s) to be dropped if this course is approved:
None

Rationale for Introduction of this Course
The students in the Mechatronics Systems Engineering program learn about electronic circuit design in only one course in the program. This course is set up to familiarise the ENSC 430 4/6 students in Mechatronics program with more advanced topics in electronic circuit design.

Scheduling and Registration Information
This course will first be offered in Fall 2011, and annually thereafter.

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

What is the probable enrolment when offered?
30

Which of your present MSE faculty have the expertise to offer this course?
Dr B. Bahreyni, Dr M. Moallem, Dr A. Rad

Are there any proposed student fees associated with this course other than tuition fees?
No

Campus where course will be taught
Surrey

Library report status
Relevant books and supplies are available in Surrey library.

Provide details on how existing instructional resources will be redistributed to accommodate this new course.

This course will use the facilities in the Electronics Laboratory at Surrey.

Exclusions

Students who have taken ENSC 325 may not take this course for further credit.

Proposed Course Outline

1. Basic MOSFET circuits

CS, CD, and CG amplifiers, Biasing of MOSFET circuits, Active loads.

2. Differential amplifiers

BJT and MOSFET differential amplifiers, Common mode signals.

3. Power amplifiers

Class A, B, and AB output stages

4. Passive and active filters

Low-pass, Band-pass, and High-pass filters, Chebichev and Butterworth filters

5. A/D and D/A

Analog-to-digital conversion, Digital-to-analog conversion, Different A/D and D/A families

6. Frequency response

Frequency response of basic amplifier stages, Approximation of circuit time constants

ENSC 430 5/6

frequency response.

7. Feedback

Gain and phase margins, Feedback, Stability, Compensation.

Contact hours:

3 hours per week

Recommended textbook

Sedra and Smith, *Microelectronic Circuits*, Oxford University Press, Fifth Edition

Evaluation

Evaluation Component Percentage of overall mark (out of 100)

5 assignments 10%

4 laboratory experiments 10%

5 quizzes 20%

1 Midterm exam 20%

Final exam 40%

The midterm and final exams are closed book examinations of the course material. Students are permitted to use a letter size crib sheet (double-sided)



SENATE COMMITTEE ON
UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL
PAGE 3 OF 3 PAGES

COURSE NUMBER ENSC 432 - 3

COURSE TITLE

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

AND

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

CREDITS

Indicate number of credits for: Lecture 3 Seminar _____ Tutorial 1 Lab _____

COURSE DESCRIPTION (FOR CALENDAR). 50-60 WORDS MAXIMUM. ATTACH A COURSE OUTLINE TO THIS PROPOSAL.

An introduction to manufacturing systems: industrial robotics, manufacturing system components and definitions, material handling systems, production lines, assembly systems, robotic cell design, cellular manufacturing, flexible manufacturing systems, quality control, manufacturing support systems.

PREREQUISITE

ENSC 387

COREQUISITE

None

SPECIAL INSTRUCTIONS

That is, does this course replicate the content of a previously-approved course to such an extent that students should not receive credit for both courses? If so, this should be **noted in the prerequisite**.

COURSES(S) TO BE DELETED IF THIS COURSE IS APPROVED

NOTE: APPROPRIATE DOCUMENT FOR DELETION MUST BE SUBMITTED TO SCUS

None

RATIONALE FOR INTRODUCTION OF THIS COURSE

The students in the Mechatronics Systems Engineering program will learn about industrial robotics and manufacturing systems, which are important practical industrial applications of Mechatronics. This course is an advanced undergraduate (or beginning graduate) course that will be useful for learning about robotic automation and production systems technologies in modern manufacturing plants.



SCHEDULING AND ENROLLMENT INFORMATION

Indicate effective term and year course would first be offered and planned frequency of offering thereafter:

This course will first be offered in Spring ~~2012~~ and annually thereafter.

2012

(NOTE: There is a two-term wait for implementation of any new course.)

Indicate if there is a waiver required: YES NO Will this be a required or elective course in the curriculum? Required Elective

What is the probable enrollment when offered? Estimate 30

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

Dr. Ed Park, Dr. Gary Wang, Dr. Ahmad Rad.

Are there any proposed student fees associated with this course other than tuition fees? YES NO
(If yes, attach mandatory supplementary fee approval form.)

RESOURCE IMPLICATIONS

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 a library report and, if appropriate, confirmation that funding arrangements have been addressed.

Campus where course will be taught Surrey

Library report status There are no required library materials for this course.

Provide details on how existing instructional resources will be redistributed to accommodate this new course. For example, will another course be eliminated or will the frequency of offering of other courses be reduced; are there changes in pedagogical style or class sizes that allow for this additional course offering?

There are no conflict/overlap with existing instructional resources.

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

Additional laboratory equipment/software will be purchased upon availability of funding.

Articulation agreement reviewed? YES NO Not applicable

OTHER IMPLICATIONS



APPROVALS

1 Departmental approval indicates that the Department or School has approved the content of the course, and has consulted with other Departments/Schools/Faculties regarding proposed course content and overlap issues.

Glenn Chapman
Chair, Department/School

Apr. 21 '11
Date

R. Cameron
Chair, Faculty Curriculum Committee

Apr. 21, 2011
Date

2 Faculty approval indicates that all the necessary course content and overlap concerns have been resolved, and that the Faculty/School/Department commits to providing the required Library funds.

R. Cameron
Dean or designate

Apr. 21, 2011
Date

LIST which other Departments, Schools and Faculties have been consulted regarding the proposed course content, including overlap issues. Attach documentary evidence of responses.

Science / Physics

Other Faculties approval indicated that the Dean(s) or Designate of other Faculties AFFECTED by the proposed new course support(s) the approval of the new course:

_____ Date _____

_____ Date _____

3 SCUS approval indicates that the course has been approved for implementation subject, where appropriate, to financial issues being addressed.

COURSE APPROVED BY SCUS (Chair of SCUS):

_____ Date _____

APPROVAL IS SIGNIFIED BY DATE AND APPROPRIATE SIGNATURE.

NEW COURSE PROPOSAL:***Manufacturing Systems***

Prepared by E. Park, Associate Professor
Mechatronic Systems Engineering, School of Engineering Science

Date:
May 25, 2010 (updated on June 30, 2010)

Course Number
ENSC 432

Course Title (long)
Manufacturing Systems

Course Title (short)
Manufacturing Systems

Course Description
An introduction to manufacturing systems: industrial robotics, manufacturing system components and definitions, material handling systems, production lines, assembly systems, robotic cell design, cellular manufacturing, flexible manufacturing systems, quality control, manufacturing support systems.

Weekly Hours
Lect 3; Sem 0; Tut 1; Lab 1

Keywords
Robotic manipulators, Automation, Manufacturing systems, Manufacturing cells, Assembly lines, Production lines, Flexible manufacturing, Quality control.

Prerequisite
ENSC 387, ENSC 282

Co-requisite
None

Special Instructions
None

Course(s) to be dropped if this course is approved:
None

Rationale for Introduction of this Course
The students in the Mechatronics Systems Engineering program will learn about

manufacturing systems, which are important practical and industrial applications of Mechatronics. This course is an advanced undergraduate (or beginning graduate) course that will be useful for learning about robotic automation and production systems technologies in modern manufacturing plants.

Scheduling and Registration Information

This course will first be offered in Spring 2011, and annually thereafter.

Will this be a required or elective course in the curriculum?

Elective

What is the probable enrolment when offered?

30

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

Dr. Ed Park, Dr. Gary Wang, Dr. Ahmad Rad.

Are there any proposed student fees associated with this course other than tuition fees?

No

Campus where course will be taught

Surrey

Library report status

There are no required library materials for this course.

Provide details on how existing instructional resources will be redistributed to accommodate this new course.

There are no conflict/overlap with existing instructional resources.

Proposed Course Outline

1. *Industrial Robotics*
Robot configuration, robot kinematics, robot control systems, robot programming, industrial robot applications.
2. *Introduction to Manufacturing Systems*
Components of a manufacturing system, classification of manufacturing systems, material handling systems.
3. *Manufacturing Cells (Single Station)*
Manned cells, automated cells.
4. *Cellular Manufacturing*
Parts families and classifications, production flow analysis, cellular manufacturing, group technology, robotic cell design.
5. *Flexible Manufacturing Systems*
Definition, components, applications, benefits and implementation.

6. *Quality Control*
Quality control and inspection in manufacturing.
7. *Manufacturing Support Systems*
Process and production planning.

Contact hours:

3 lecture hours per week, 1 tutorial hour per week.

Recommended textbook

M.P. Groover, *Automation, Production Systems, and Computer-Integrated Manufacturing*, Pearson Education Inc., 3rd Edition, 2008.

Evaluation

<i>Evaluation Component</i>	<i>Percentage of Overall Mark (Out of 100)</i>
5 Assignments	10%
4 Laboratory Experiments	10%
4 Quizzes	10%
1 Midterm Exam	20%
Final Exam	50%

The midterm and final exams are closed book examinations of the course material. Students are permitted to use a hand-written, letter-size cheat sheet (one-side for the midterm and double-side for the final).



COURSE NUMBER ENSC 436 ~3

COURSE TITLE

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

Advanced Vibration

AND

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

Advanced Vibration

CREDITS

Indicate number of credits for: Lecture 3 Seminar 0 Tutorial 1 Lab 3 hrs per term

COURSE DESCRIPTION (FOR CALENDAR). 3-4 LINES MAXIMUM. ATTACH A COURSE OUTLINE TO THIS PROPOSAL.

** Make all lower case.*

Advanced intro to Vibration, Free vibration, Harmonic excitation of undamped systems, Harmonic excitation of damped systems, Base excitation, Rotating unbalance, Impulse response, Response to an arbitrary input, Response to an arbitrary periodic input, Transform method, Two degree of freedom model, More than two degrees of freedom, Systems with viscous damping, Lagrange's equations, Vibrations of string or cable, Vibration of rods and bars, Torsional vibration, Bending vibration of a beam, Finite Element Method

PREREQUISITE

ENSC 380, ENSC 282

COREQUISITE

None

SPECIAL INSTRUCTIONS

That is, does this course replicate the content of a previously-approved course to such an extent that students should not receive credit for both courses.? If so, this should be noted in the prerequisite.

COURSE(S) TO BE DELETED IF THIS COURSE IF APPROVED. NOTE: APPROPRIATE DOCUMENT FOR DELETION MUST BE SUBMITTED TO SCUS.

RATIONALE FOR INTRODUCTION OF THIS COURSE.

This Course is core mechanical engineering. Our Mechatronics students will encounter to vibration problems in their workplaces. This course teaches analytical approach to model vibration and design a proper vibration isolator. It also has practical aspects of vibration simulations and design.



**SCHEDULING AND ENROLLMENT
INFORMATION**

Indicate effective term and year course would first be offered and planned frequency of offering thereafter:

This Course can be offered from spring 2012 as an elective course. The frequency of offering can be 1 year

(NOTE: There is a two-term wait for implementation of any new course.)

Indicate if there is a waiver required: YES NO Will this be a required or elective course in the curriculum? Required Elective

What is the probable enrollment when offered? Estimate 30

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

Dr. Arzanpour, Dr. Golnaraghi

Are there any proposed student fees associated with this course other than tuition fees? YES NO
(If yes, attach mandatory supplementary fee approval form.)

RESOURCE IMPLICATIONS

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 a library report and, if appropriate, confirmation that funding arrangements have been addressed.

Campus where course will be taught Surrey

Library report status Relevant books and supplies are available in Surrey library

Provide details on how existing instructional resources will be redistributed to accommodate this new course. For example, will another course be eliminated or will the frequency of offering of other courses be reduced; are there changes in pedagogical style or class sizes that allow for this additional course offering?

The equipment for a decent lab is available. The only problem will management of the resources if a large number of students enrol to this course.

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

None

Articulation agreement reviewed? YES NO Not applicable

OTHER IMPLICATIONS



APPROVALS

- 1 Departmental approval indicates that the Department or School has approved the content of the course, and has consulted with other Departments/Schools/Faculties regarding proposed course content and overlap issues.

Glenn Chapman
Chair, Department/School

Apr 21 '11
Date

R. Cameron
Chair, Faculty Curriculum Committee

Apr. 21, 2011
Date

- 2 Faculty approval indicates that all the necessary course content and overlap concerns have been resolved, and that the Faculty/School/Department commits to providing the required Library funds.

R. Cameron
Dean or designate

Apr. 21, 2011
Date

LIST which other Departments, Schools and Faculties have been consulted regarding the proposed course content, including overlap issues. Attach documentary evidence of responses.

SCI. / PHYSICS

Other Faculties approval indicated that the Dean(s) or Designate of other Faculties AFFECTED by the proposed new course support(s) the approval of the new course:

_____ Date _____

_____ Date _____

- 3 SCUS approval indicates that the course has been approved for implementation subject, where appropriate, to financial issues being addressed.

COURSE APPROVED BY SCUS (Chair of SCUS):

_____ Date _____

APPROVAL IS SIGNIFIED BY DATE AND APPROPRIATE SIGNATURE.

NEW COURSE PROPOSAL

Prepared by Siamak Arzanpour

Date: March 29 2010

Course Number: ENSC 436

Course Title (long) Advanced Vibration

Course Title (short)

Advanced Vibration

Weekly Hours 4

Lecture: 3 Tutorial: 1 Laboratory: 3 hours whole term

Keywords:

Vibration; Harmonic excitation; Lagrange's equations; Transform method, Finite Element method,

Prerequisite MATH 310, ENSC 282

Co-requisite

Special Instructions

Course(s) to be dropped if this course is approved:

None

Rationale for Introduction of this Course

This Course is core mechanical engineering. Our Mechatronics students will encounter to vibration problems in their workplaces. This course teaches analytical approach to model vibration and design a proper vibration isolator. It also has practical aspects of vibration simulations and design.

Scheduling and Registration Information

This course will first be offered from Spring 2011, and annually thereafter.

ENSC 436 4/6

Will this be a required or elective course in the curriculum?

It will be an elective course

What is the probable enrolment when offered?

The only major problem is the lab. We only have one shaker and we should decide how to run the lab.

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

Siamak Arzanpour, Farid Golnaraghi

Are there any proposed student fees associated with this course other than tuition fees?

No

Campus where course will be taught

Surrey

Library report status

The current library materials in Surrey is sufficient for this course.

Provide details on how existing instructional resources will be redistributed to accommodate this new course.

The equipments for a decent lab is available. The only problem will management of the resources if a large number of students enrol to this course.

Proposed Course Outline

Introduction to Vibration, Free vibration, Harmonic excitation of undamped systems, Harmonic excitation of damped systems, Base excitation, Rotating unbalance, Impulse response, Response to an arbitrary input, Response to an arbitrary periodic input, Transform method, Two degree of freedom model, More than two degrees of freedom, Systems with viscous damping, Lagrange's equations, Vibrations of string or cable, Vibration of rods and bars, Torsional vibration, Bending vibration of a beam, Finite Element Method

- Review of free and forced vibration of single-degree-of-freedom systems (2 week)

- Vibration in two-degrees of freedom systems (2 weeks)

- Vibration in multi-degree of freedom systems (3 weeks)

ENSC 436 5/6

- Approximate methods and modelling of mechanical systems (2 weeks)

- Vibration in continuous systems (3 weeks)

Contact hours

3 lecture hours per week, 1 tutorial hour per week, 3 lab hours per term

Recommended textbook

Engineering Vibration by Inman

Evaluation

Evaluation Component Percentage of overall mark (out of 100)

Assignments and Laboratories 20%

Midterm 30%

Final 50%