Lassonde Mechanical Engineering - Undergraduate Program Map

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Year 1

Fall
- Computational Thinking through Mechatronics EECS 1011
- Applied Calculus I MATH 1013
- Applied Linear Algebra MATH 1025
- Engineering Mechanics PHYS 1800
- Renaissance Engineer 1: Ethics, Communication & Problem Solving ENG 1101

Winter
- Object Oriented Programming from Sensors to Actuators EECS 1021
- Applied Calculus II MATH 1014
- The Earth Environment ESSE 1012
- Renaissance Engineer 2: Engineering Design Principles ENG 1102
- Chemistry and Materials Science for Engineers CHEM 1100
- Electricity, Magnetism & Optics for Engineers PHYS 1801

Summer
- Thermodynamics MECH 2201 OR Engineering Graphics & CAD Modelling MECH 2401
- Engineering Projects: Management, Economics & Safety ENG 2001

Year 2

Fall
- Applied Multivariate & Vector Calculus MATH 2015
- Thermodynamics MECH 2201 OR Engineering Graphics & CAD Modelling MECH 2401
- Dynamics MECH 2302 OR Instrumentation & Measurement Techniques MECH 2502
- Mechanics of Material MECH 2301
- Engineering Projects: Management, Economics & Safety ENG 2001

Winter
- Differential Equations for Scientists & Engineers MATH 2271
- Introduction to Probability & Statistics MATH 2930
- Heat and Flow Engineering Principles MECH 2202
- Dynamics MECH 2302 OR Instrumentation & Measurement Techniques MECH 2502
- Mini Design Project 1 MECH 2412
- Effective Engineering Communication ENG 2003 OR Effective Engineering Communication ENG 2003
- Complementary Elective 1

Summer
- Machine Elements Design MECH 3409 OR Machine Elements Design MECH 3409

Year 3

Fall
- Engineering Thermodynamics MECH 3201
- Fluid Dynamics MECH 3202
- Electrical Systems for Mechanical Engineers EECS 3505
- Solid Mechanics & Materials Laboratory EECS 3502
- Machine Elements Design MECH 3409
- Engineering & the Environment ESSE 2210
- Complementary Elective 2

Winter
- Heat Transfer MECH 3203
- Thermofluid Laboratory MECH 3504
- Mini Design Project 2 MECH 3401
- Macro-and-Micro Manufacturing Methods MECH 3503
- Mechanisms for Mechanical Systems MECH 3302
- Mechanical Engineering: Professionalism & Society MECH 2112

Summer
- Professional Engineering Practice ENG 3000 OR Professional Engineering Practice ENG 3000

Year 4

Fall
- Simulation Tools for Design & Analysis MECH 4402
- Engineering Project (Capstone) ENG 4000
- Introduction to Control Systems ENG 4550
- Vibrations & Actuators MECH 4502
- Complementary Elective 3

Winter
- System Level Engineering MECH 4401
- Life-cycle Analysis & Sustainability MECH 4504
- Engineering Project (Capstone) ENG 4000
- Technical Elective** 1
- Technical Elective** 2
- Complementary Elective 4

Course Info:

Prerequisite(s):

Course credit exclusions:

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**

MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

EECS 1011 3.00 Computational Thinking through Mechatronics

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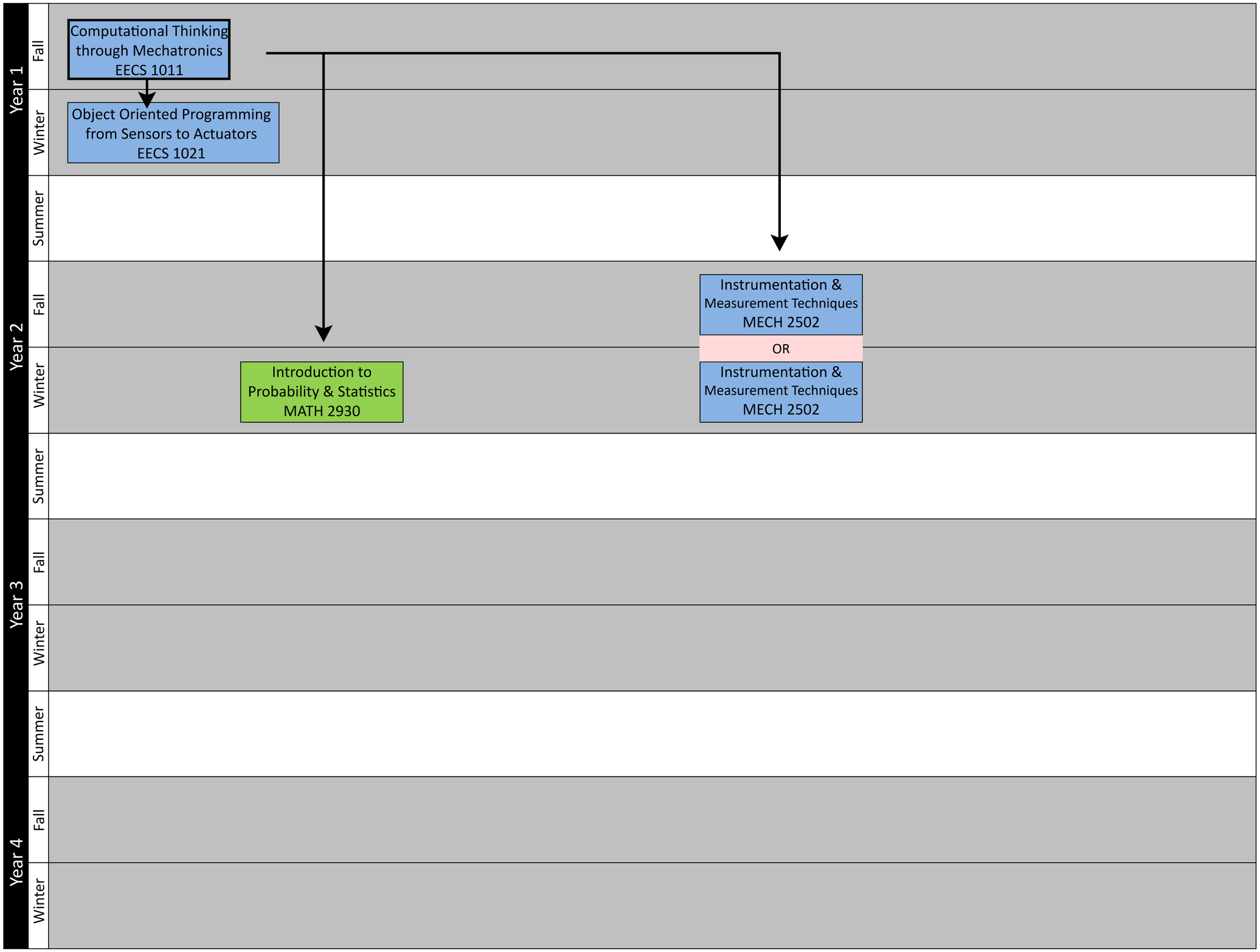

EECS 1011 3.00
The Objectives of 1011 are threefold: providing a first exposure to procedural programming, teaching students a set of soft computing skills (such as reasoning about algorithms, tracing programs, test-driven development), and demonstrating how computers are used in a variety of engineering disciplines. It uses problem-based pedagogy to expose the underlying concepts and an experiential laboratory to implement them. An integrated computing environment (such as MATLAB) is used so that students can pick up key programming concepts(such as variables and control flow) without being exposed to complex or abstract constructs. The problems are chosen with consultation with the various engineering disciplines in the Faculty with a view of exposing how computing is used in these disciplines.

Prerequisites: None.

Course credit exclusions:
LE/EECS1541 3.00

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

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MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MATH 1013 3.00 Applied Calculus I

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MATH 1013 3.00
Introduction to the theory and applications of both differential and integral calculus. Limits. Derivatives of algebraic and trigonometric functions. Riemann sums, definite integrals and the Fundamental Theorem of Calculus. Logarithms and exponentials, Extreme value problems, Related rates, Areas and Volumes.

Prerequisites:
SC/MATH 1520 3.00,
or 12U Calculus & Vectors (MCV4U), or equivalent.

Course credit exclusions:
SC/MATH 1300 3.00,
SC/MATH 1505 6.00,
SC/MATH 1530 3.00,
SC/MATH 1550 6.00,
GL/MATH/MODR 1930 3.00,
AP/ECON 1530 3.00,
SC/ISCI 1401 3.00,
SC/ISCI 1410 6.00.

Mathematics Courses
Thermofluid Courses
Mechatronics Courses
Solid Mechanics Courses
Design Courses
Soft Skills Courses
Advanced Mechanics Courses

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MECH 4201: Transport Phenomena
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MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MATH 1025 3.00 Applied Linear Algebra

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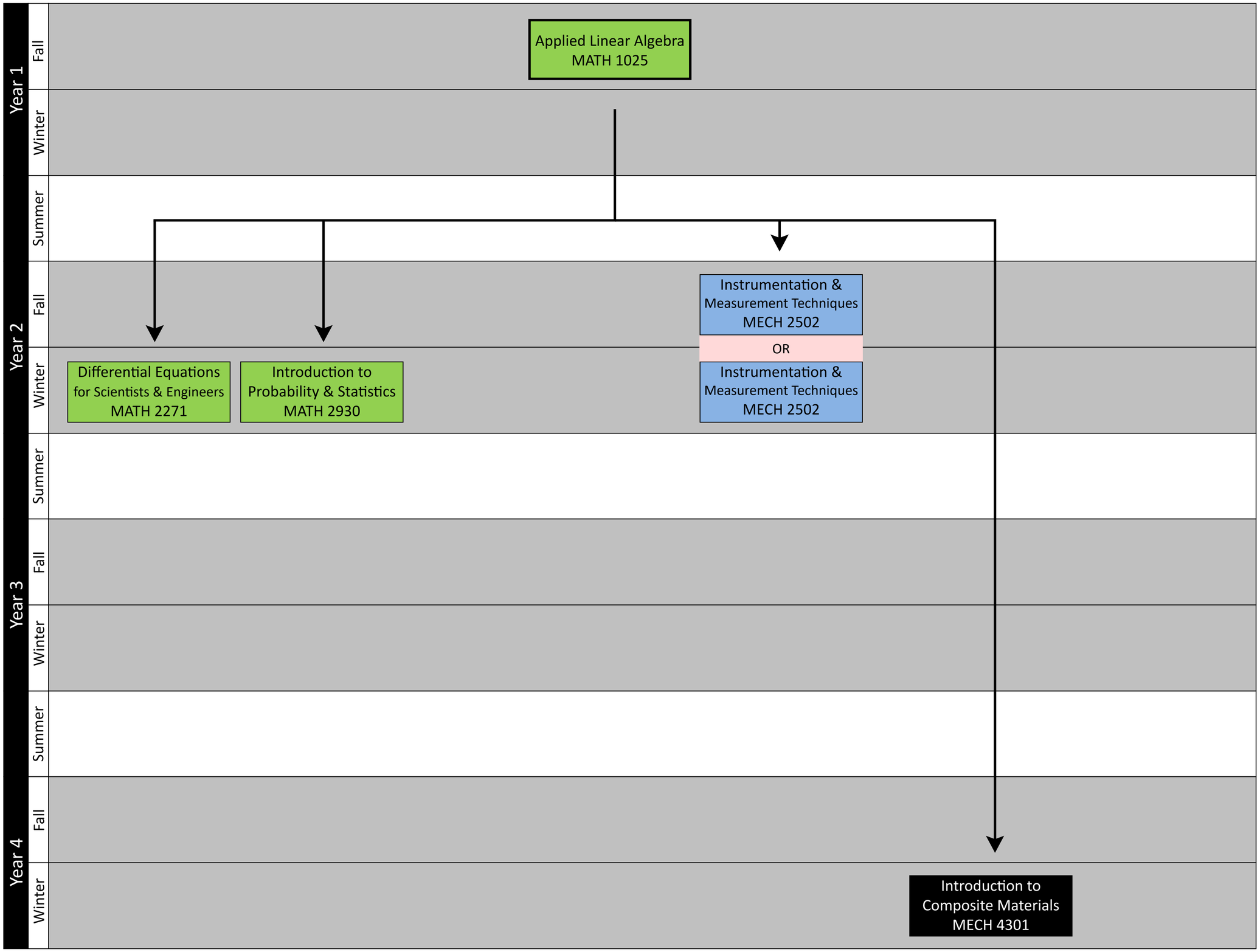

MATH 1025 3.00
Topics include spherical and cylindrical coordinates in Euclidean 3-space, general matrix algebra, determinants, vector space concepts for Euclidean n-space (e.g. linear dependence and independence, basis, dimension, linear transformations etc.), an introduction to eigenvalues and eigenvectors.

Prerequisites:
12U Advanced functions (MHF4U), or equivalent.

Course credit exclusions:
SC/MATH 1021 3.00,
SC/MATH 2221 3.00,
GL/MATH/MODR 2650 3.00.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
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ENG 1101 4.00 Renaissance Engineer 1: Ethics, Communication & Problem Solving

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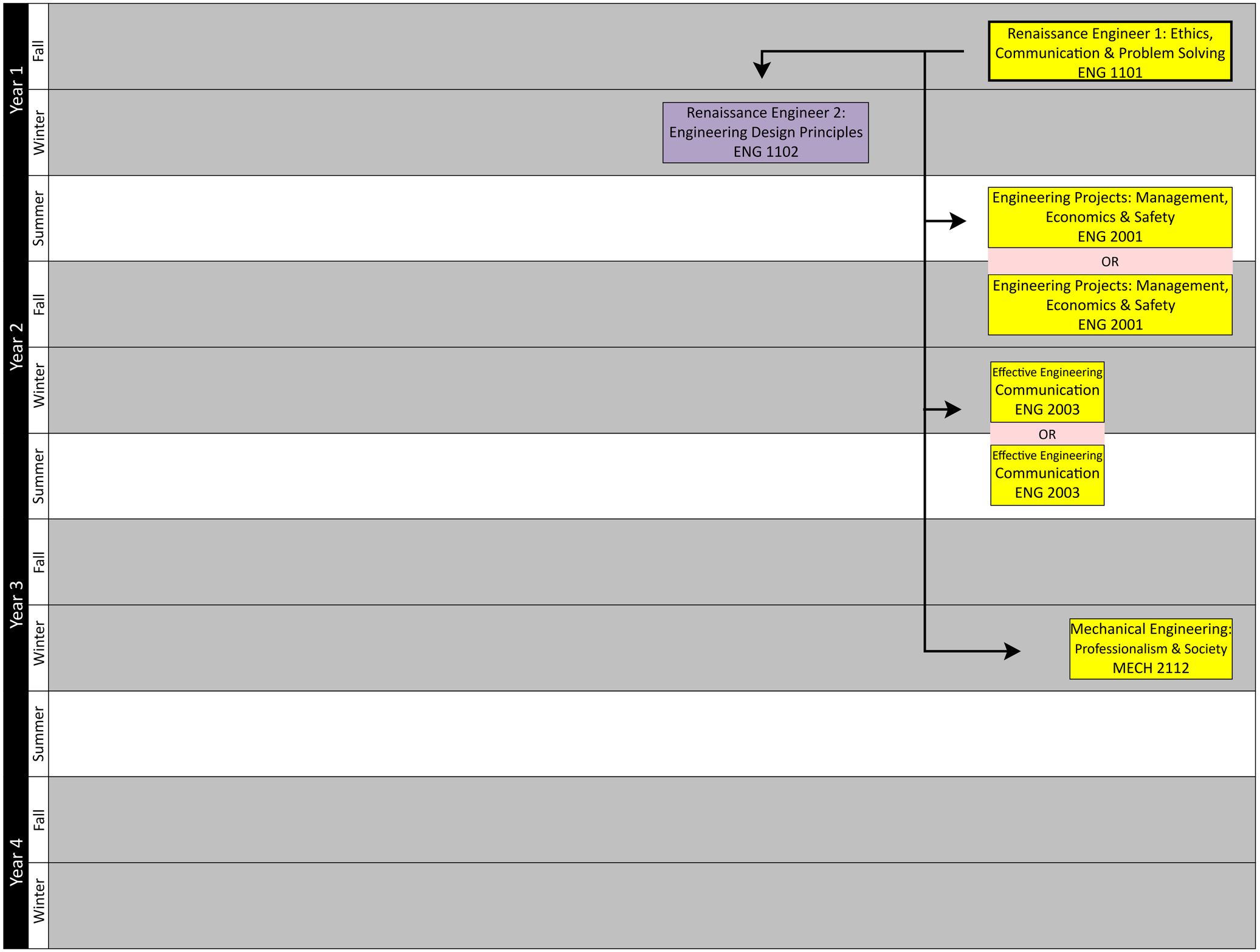

ENG 1101 4.00
Who is an engineer and what are his/her ethical and academic integrity obligations; communications strategies for technical subjects in oral and written forms; dealing with ambiguity, uncertainties, and open ended problems in a technical context, problem definition strategies.

Prerequisites: None.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

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PHYS 1800 3.00 Engineering Mechanics

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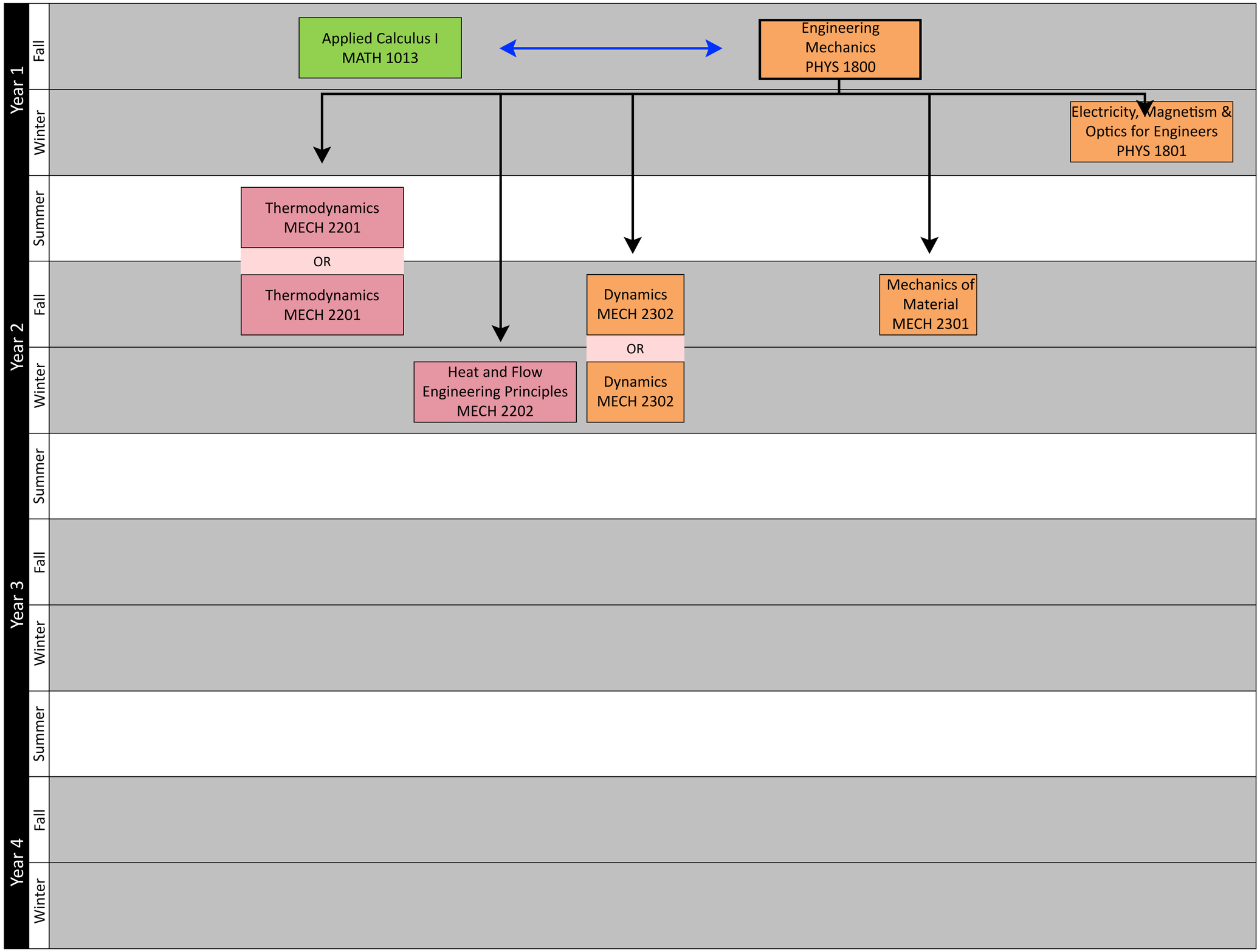

PHYS 1800 3.00
Survey of the fundamental concepts of statics and dynamics with an emphasis on engineering applications. This is a calculus-based course intended primarily for engineering students.

Prerequisites:
12U Physics,
or OAC Physics,
or SC/PHYS 1510 4.00,

or MHF4U Advanced Functions and MCV4U Calculus and Vectors,

or 12U Advanced Functions and Introductory Calculus,

or OAC Algebra and OAC Calculus.

Corequisites:
SC/MATH 1013 3.00,
or SC/MATH 1300 3.00,
or SC/MATH 1505 6.00.

Course credit exclusions:
SC/PHYS 1010 6.00,
SC/PHYS 1410 6.00,
SC/PHYS 1420 6.00,
SC/ISCI 1310 6.00,
SC/ISCI 1301 3.00.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

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MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

EECS 1021 3.00 Object Oriented Programming from Sensors to Actuators

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Year 1	Fall	Computational Thinking through Mechatronics EECS 1011
	Winter	Object Oriented Programming from Sensors to Actuators EECS 1021
	Summer	
Year 2	Fall	
	Winter	
	Summer	
Year 3	Fall	
	Winter	
	Summer	
Year 4	Fall	
	Winter	

EECS 1021 3.00
Introduces student to computational thinking - a process-based approach to problem solving. It uses a problem-based pedagogy to expose the underlying concepts and an experiential laboratory to implement them. The programming language is chosen so that it is widely used in a variety of applications, is object-oriented, and is of industrial strength (Java is an example of such a language). The problems are chosen in order to expose abstract programming concepts by immersing them in relevant and engaging applications. The experiential laboratory is based on sensors and actuators that connect to a computer. The problems are chosen with consultation with the various engineering disciplines in the Faculty with a view of exposing how computing is used in these disciplines.

Prerequisites:
LE/EECS 1011 3.00

Course credit exclusions:
LE/EECS 1022 3.00

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
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- Soft Skills Courses
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MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MATH 1014 3.00 Applied Calculus II

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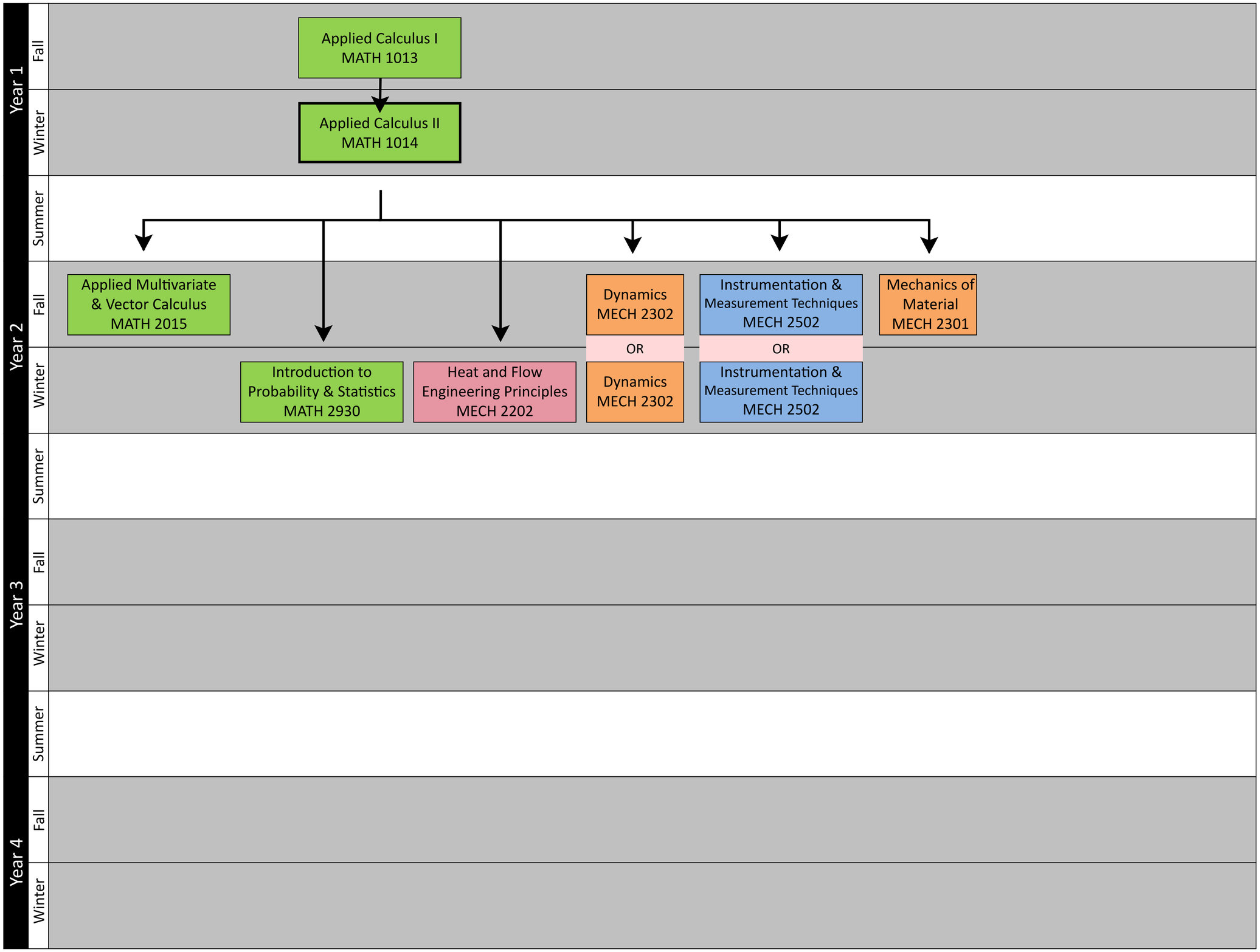

MATH 1014 3.00
Calculus in Polar Coordinates. Techniques of Integration. Indeterminate Forms. Improper Integrals. Sequences, infinite series and power series. Approximations. Introduction to ordinary differential equations.

Prerequisites:
One of
SC/MATH 1013 3.00,
SC/MATH 1300 3.00,
GL/MATH 1901 3.00,
SC/ISCI 1401 3.00;

for non-science students only, six credits from:

SC/MATH 1550 6.00,

SC/MATH 1530 3.00
and SC/MATH 1540 3.00,

AP/ECON 1530 3.00
and AP/ECON 1540 3.00.

Course credit exclusions:
SC/MATH 1310 3.00,
SC/MATH 1505 6.00,
GL/MATH/MODR 1940 3.00,
SC/ISCI 1402 3.00,
SC/ISCI 1410 6.00.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
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MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

ESSE 1012 3.00 The Earth Environment

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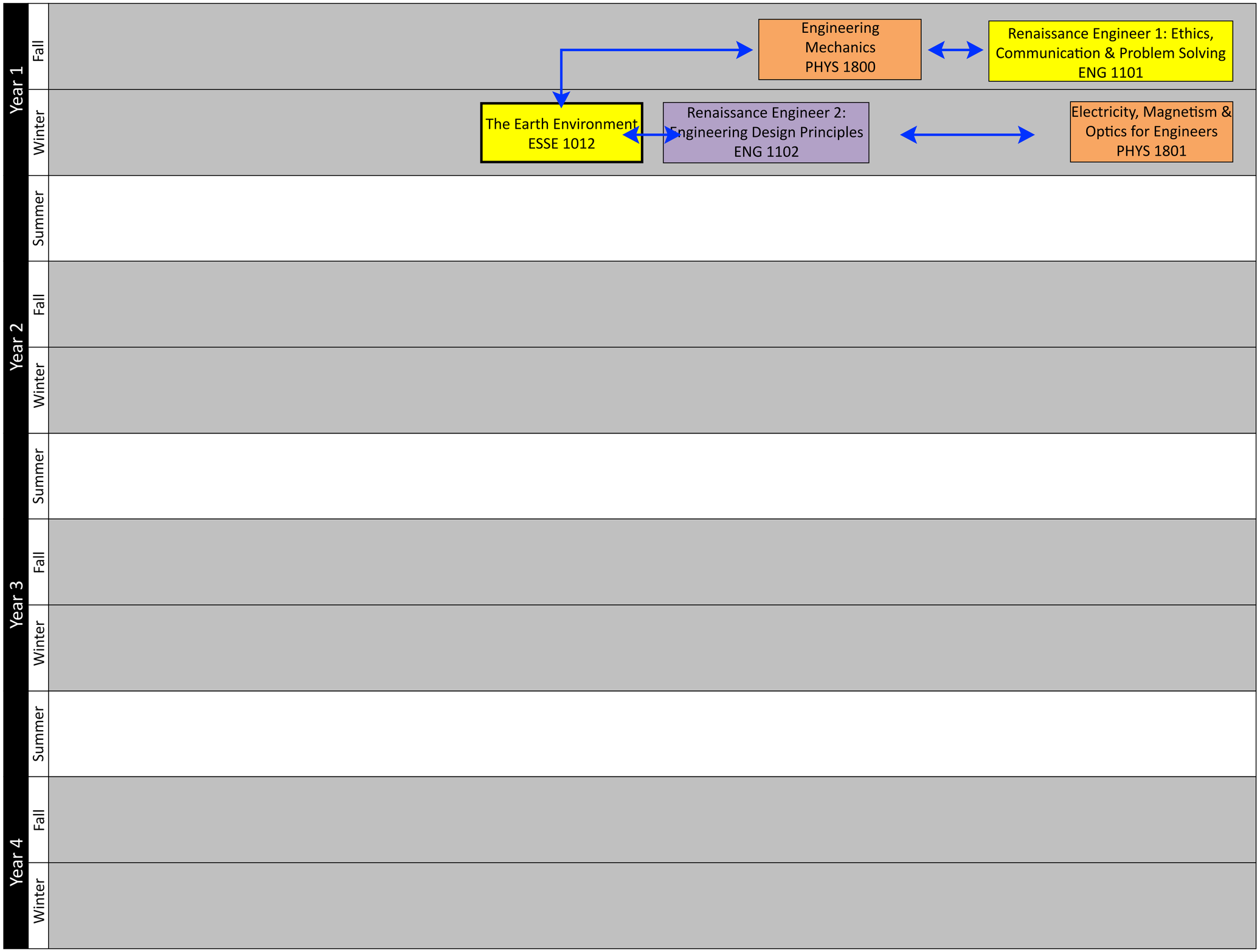

ESSE 1012 3.00
Provides essential topics in Earth environment (Earth and oceanic science, atmospheric science, and geology) and explores the role played by global and local scale processes in shaping our planet. Concepts are described; the latest technology discussed, and links between engineering disciplines are provided. The course lectures are complemented by hands-on laboratory and field experience.

Prerequisites:
12U calculus and vectors,
or 12U advanced functions,
or SC/MATH 1515 3.00;
12U physics,
or SC/PHYS 1510 4.00.

Corequisites:
LE/ENG 1101 4.00;
LE/ENG 1102 4.00;
SC/PHYS 1800 3.00,
SC/PHYS 1801 3.00

Course credit exclusions: None.

Mathematics Courses
Thermofluid Courses
Mechatronics Courses
Solid Mechanics Courses
Design Courses
Soft Skills Courses
Advanced Mechanics Courses

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MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

ENG 1102 4.00 Renaissance Engineer 2: Engineering Design Principles

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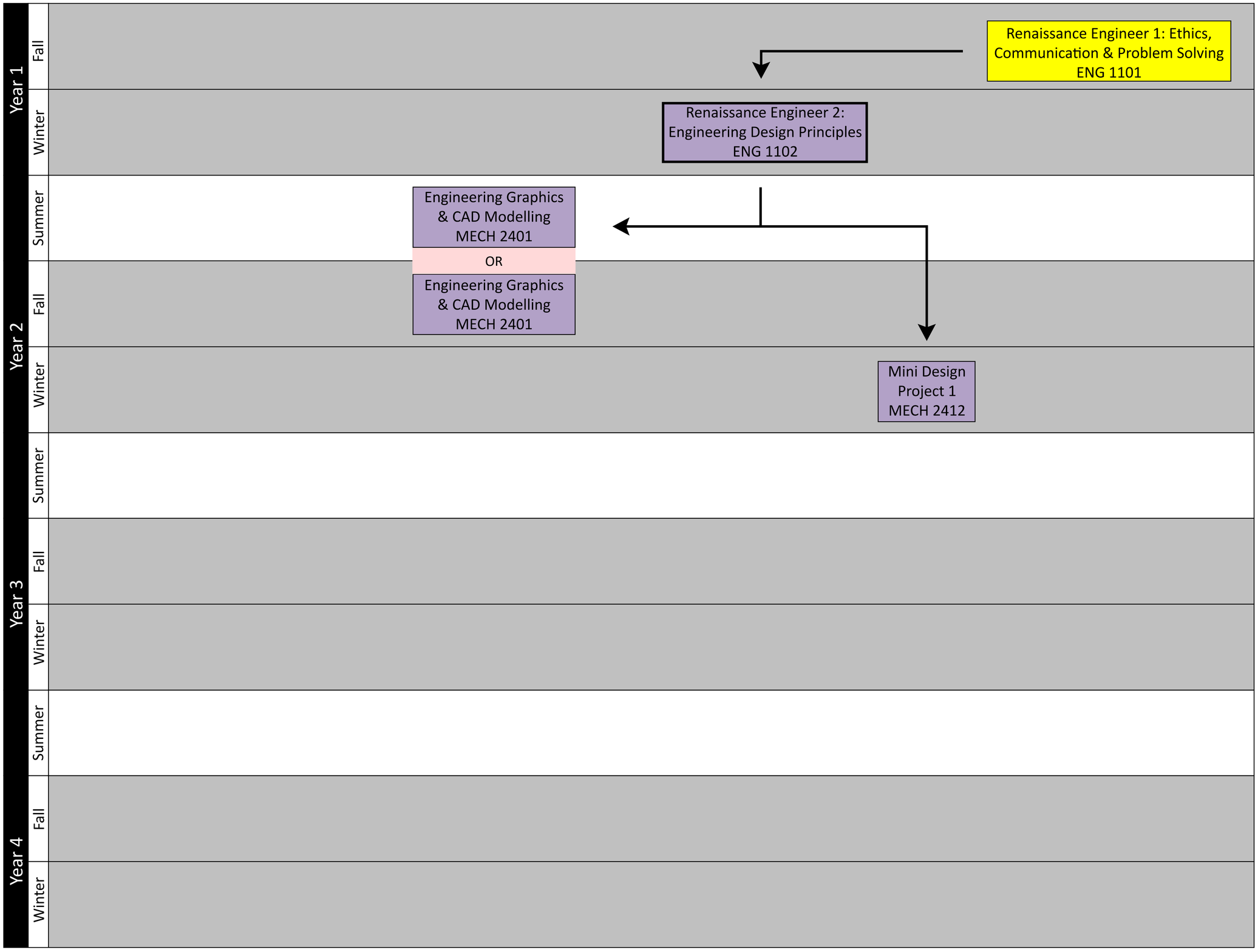

ENG 1102 4.00
This course will cover: engineering design methodology; features and elements of good design with environment and human interface considerations; aesthetics in design and idea communication using graphics and technical drawings.

Prerequisites:
LE/ENG 1101 3.00

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

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MECH 4203: Energy Conversion and Storage
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CHEM 1100 4.00 Chemistry and Materials Science for Engineers

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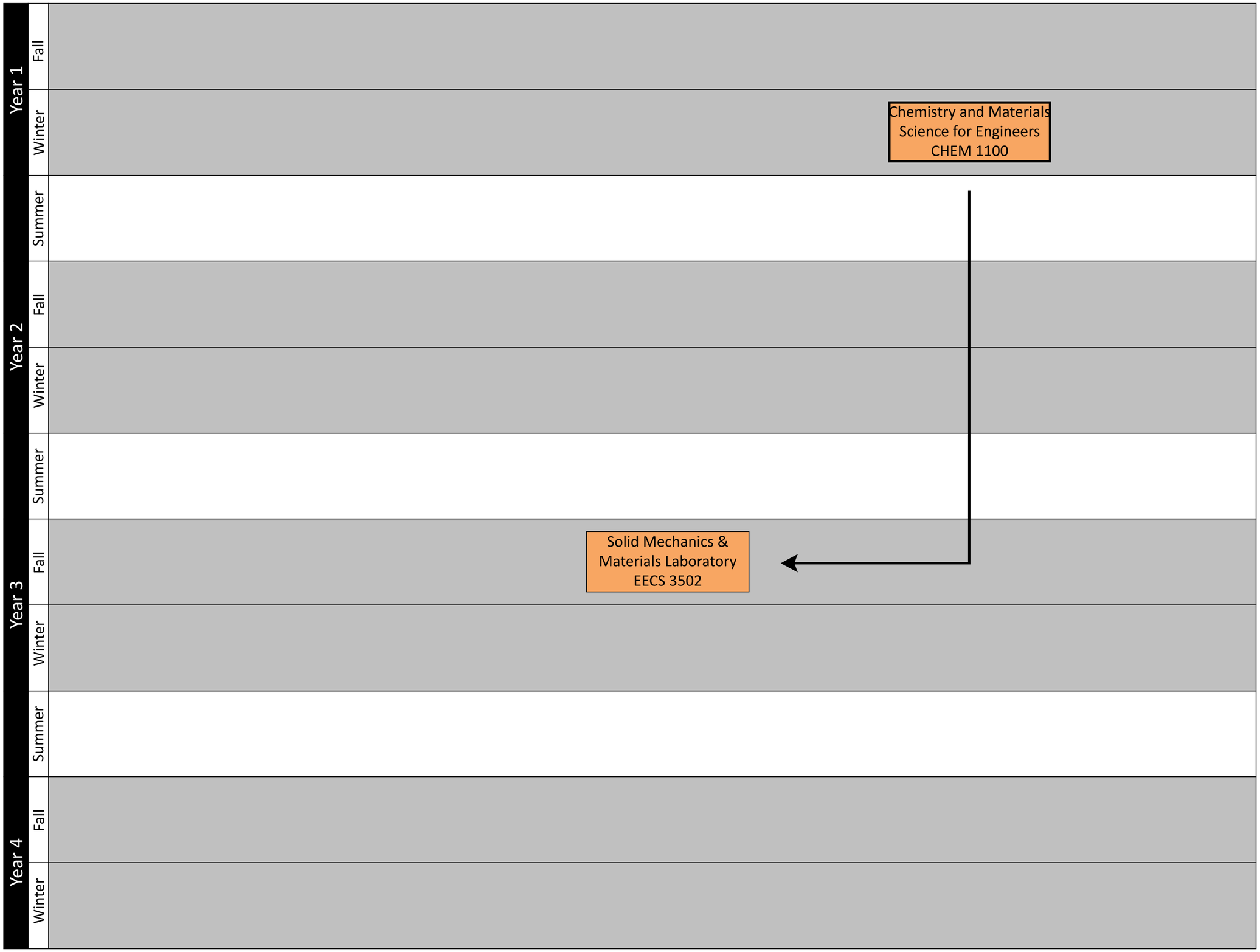

Mathematics Courses
Thermofluid Courses
Mechatronics Courses
Solid Mechanics Courses
Design Courses
Soft Skills Courses
Advanced Mechanics Courses

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MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

CHEM 1100 4.00

The course is designed for Engineering students interested in refreshing and expending their general chemistry knowledge while exploring the relationship between structure of matter, properties and processing. This course will focus mainly at covering important introductory concept to understand solution chemistry including reactivity, thermochemistry, structure and properties of materials. The course is divided in six sections. The first section covers an introduction to the topic of Materials Science and its impact on our daily lives as well as future trends and review key chemistry concepts required for this course. The second section will present the states of matter (gas, liquid and solid), their physical characteristics and the forces holding materials together (bonding and intermolecular forces). The third section will expend on the liquid phase and properties of solutions including equilibrium, solubility, pH and pKa. The fourth section will deal with thermochemistry and its first law with an emphasis on enthalpy as well as phase changes and phase diagrams. Section six will present an introduction to the properties of solids (electronic and mechanical) and criteria in the selection of materials will also be discussed. Section seven will present in more details structure-properties and processing of soft materials (natural and artificial polymer) in the context of the material covered in the other sections.

Prerequisites:
12U chemistry or equivalent

Course credit exclusions:
SC/CHEM 1000 3.00

PHYS 1801 3.00 Electricity, Magnetism & Optics for Engineers

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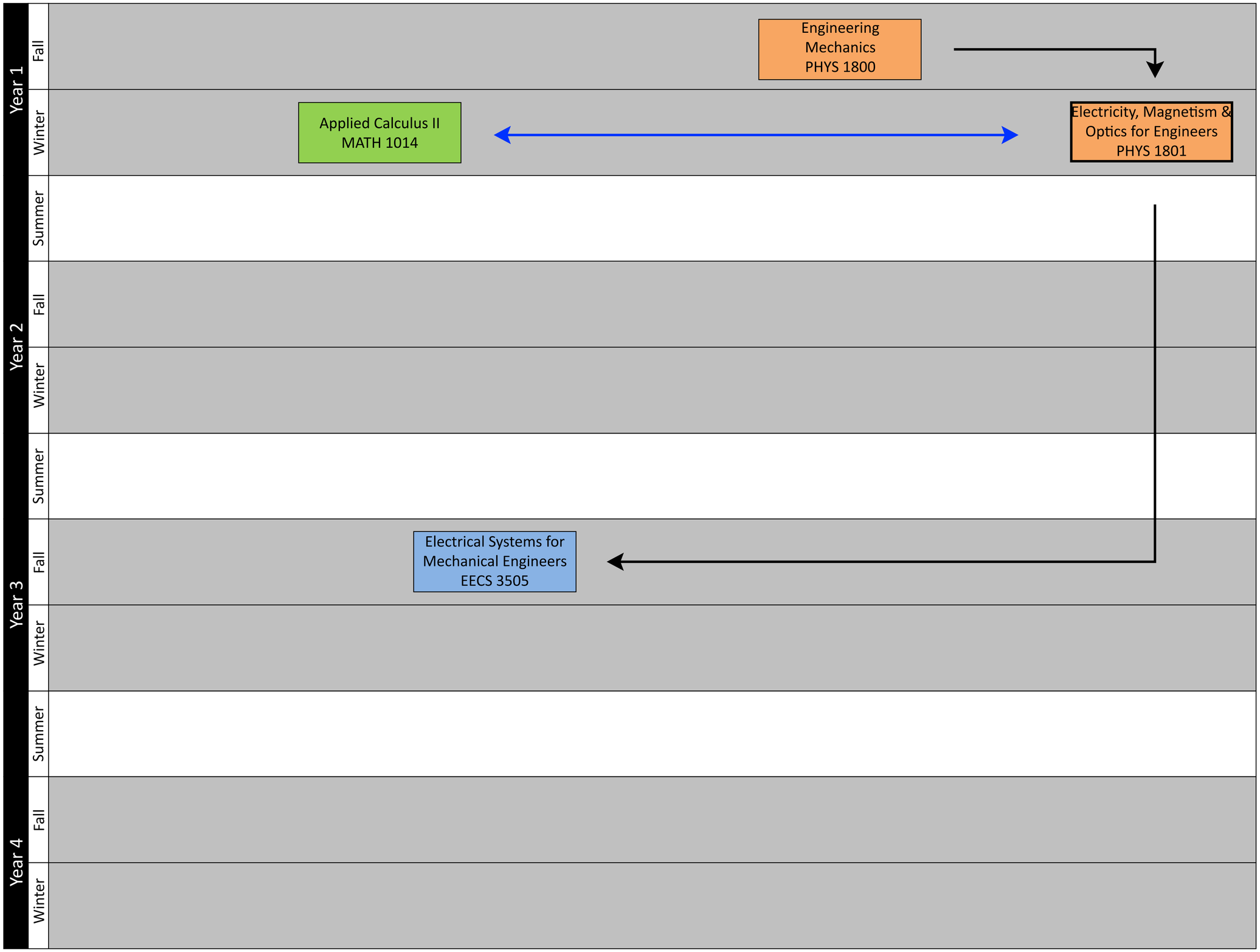

PHYS 1801 3.00
A survey of physics in which fundamental concepts in electricity, magnetism and optics are emphasized through engineering applications. This is a calculus-based course intended primarily for engineering students.

Prerequisites:
SC/PHYS 1800 3.00
and SC/MATH 1013 3.00
or equivalent.

Corequisites:
SC/MATH 1014 3.00,
or SC/MATH 1310 3.00,
or SC/MATH 1505 6.00.

Course Credit exclusions:
SC/PHYS 1010 6.00,
SC/PHYS 1410 6.00,
SC/PHYS 1420 6.00;
SC/ISCI 1310 6.00,
SC/ISCI 1302 3.00.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
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MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MATH 2015 3.00 Applied Multivariate and Vector Calculus

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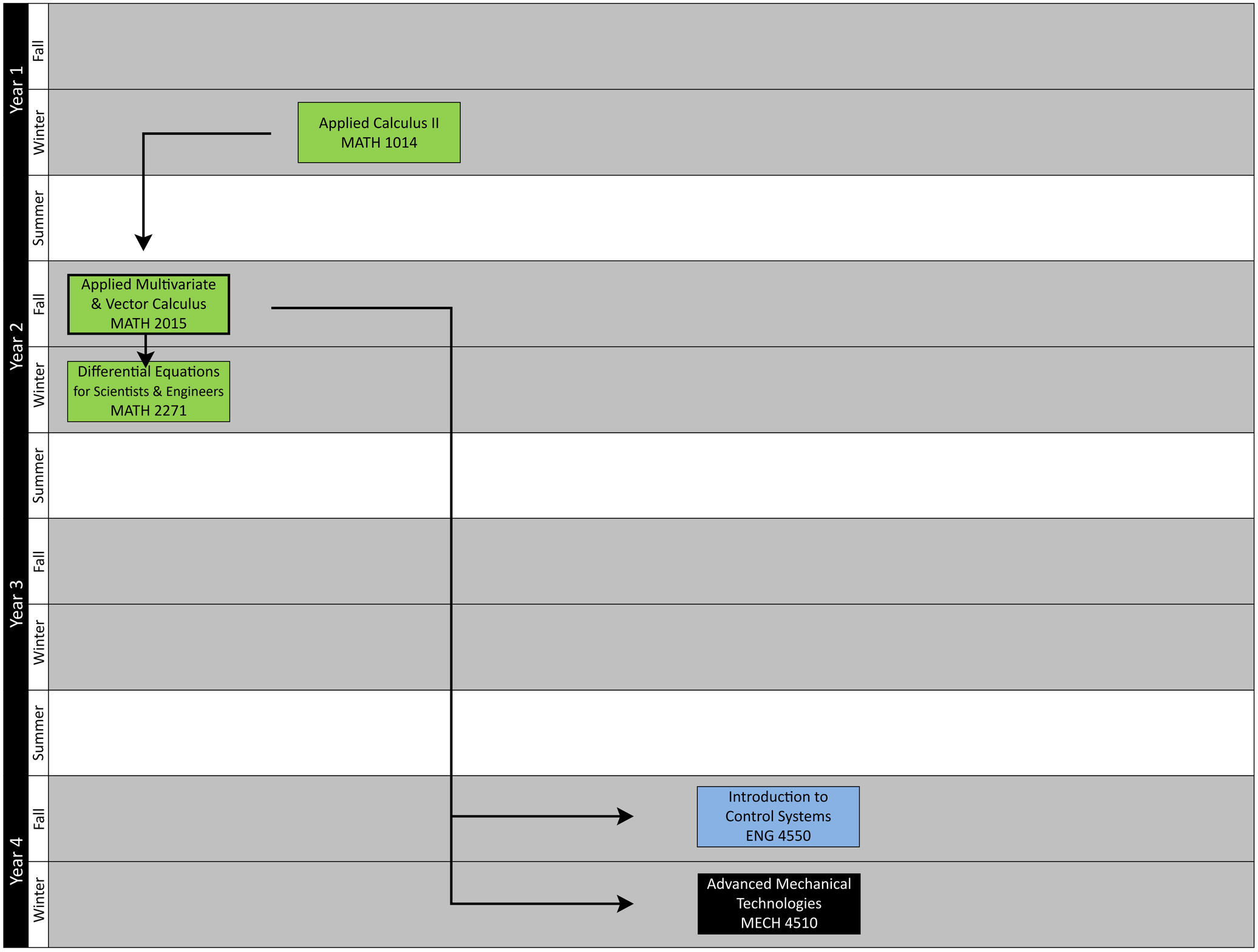

MATH 2015 3.00:
Topics covered include partial derivatives; grad, div, curl and Laplacian operators; line and surface integrals; theorems of Gauss and Stokes; double and triple integrals in various coordinate systems; extrema and Taylor series for multivariate functions.

Prerequisites:
One of
SC/MATH 1010 3.00,
SC/MATH 1014 3.00,
SC/MATH 1310 3.00; or
SC/MATH 1505 6.00 plus permission of the course coordinator.

Course credit exclusions:
SC/MATH 2010 3.00,
SC/MATH 2310 3.00,
GL/MATH 2670 3.00,
GL/MODR 2670 3.00,
GL/MATH 3200 3.00.

- Mathematics Courses
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- Mechatronics Courses
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ENG 4650: Feedback Control Systems

MECH 2201 3.00 Thermodynamics

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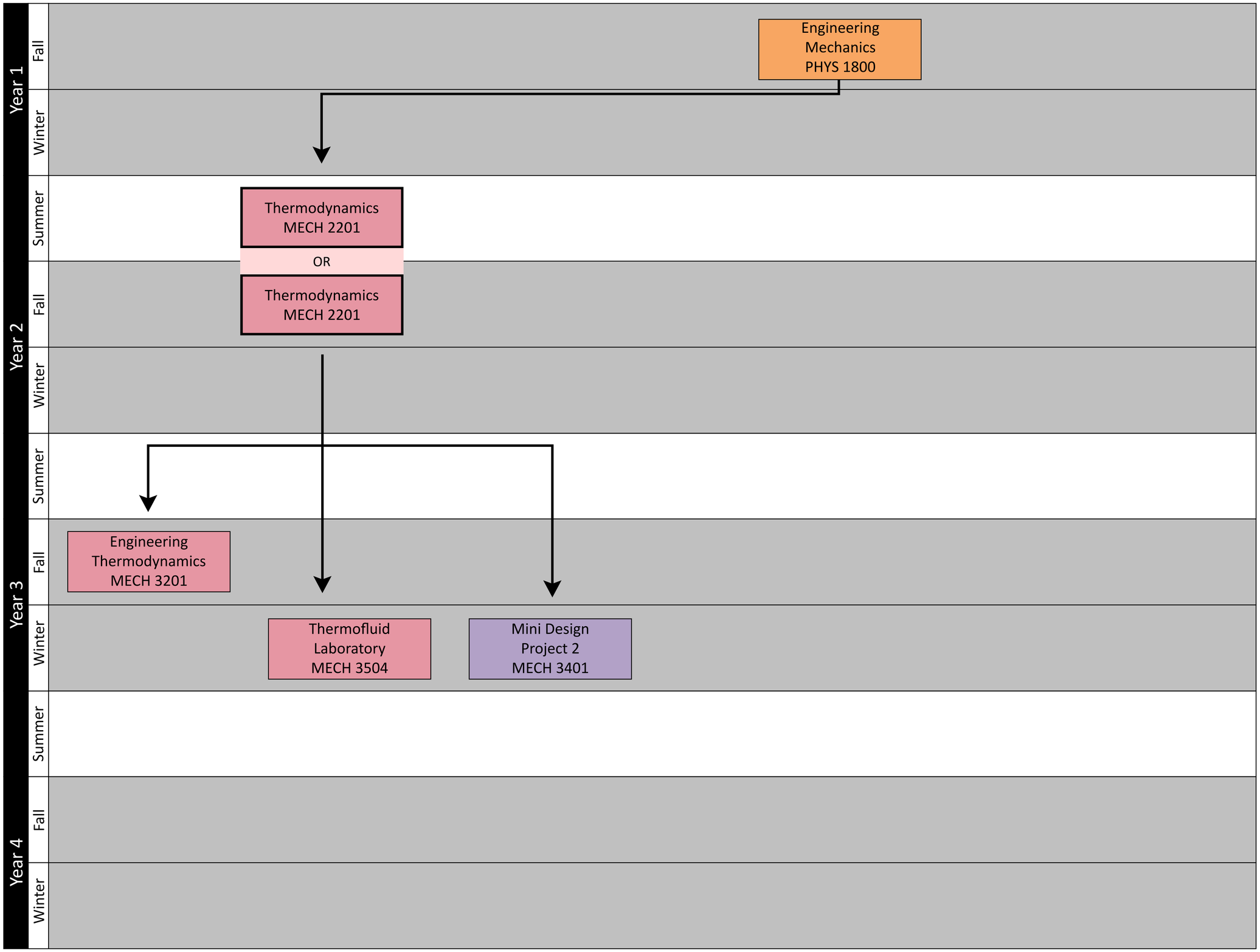

MECH 2201 3.00
This course covers properties and behaviour of substances, first and second laws of thermodynamics, applications of thermodynamics laws to closed and open systems, and availability.

Prerequisites:
SC/PHYS 1800 3.00

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

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MECH 2401 3.00 Engineering Graphics & CAD Modelling

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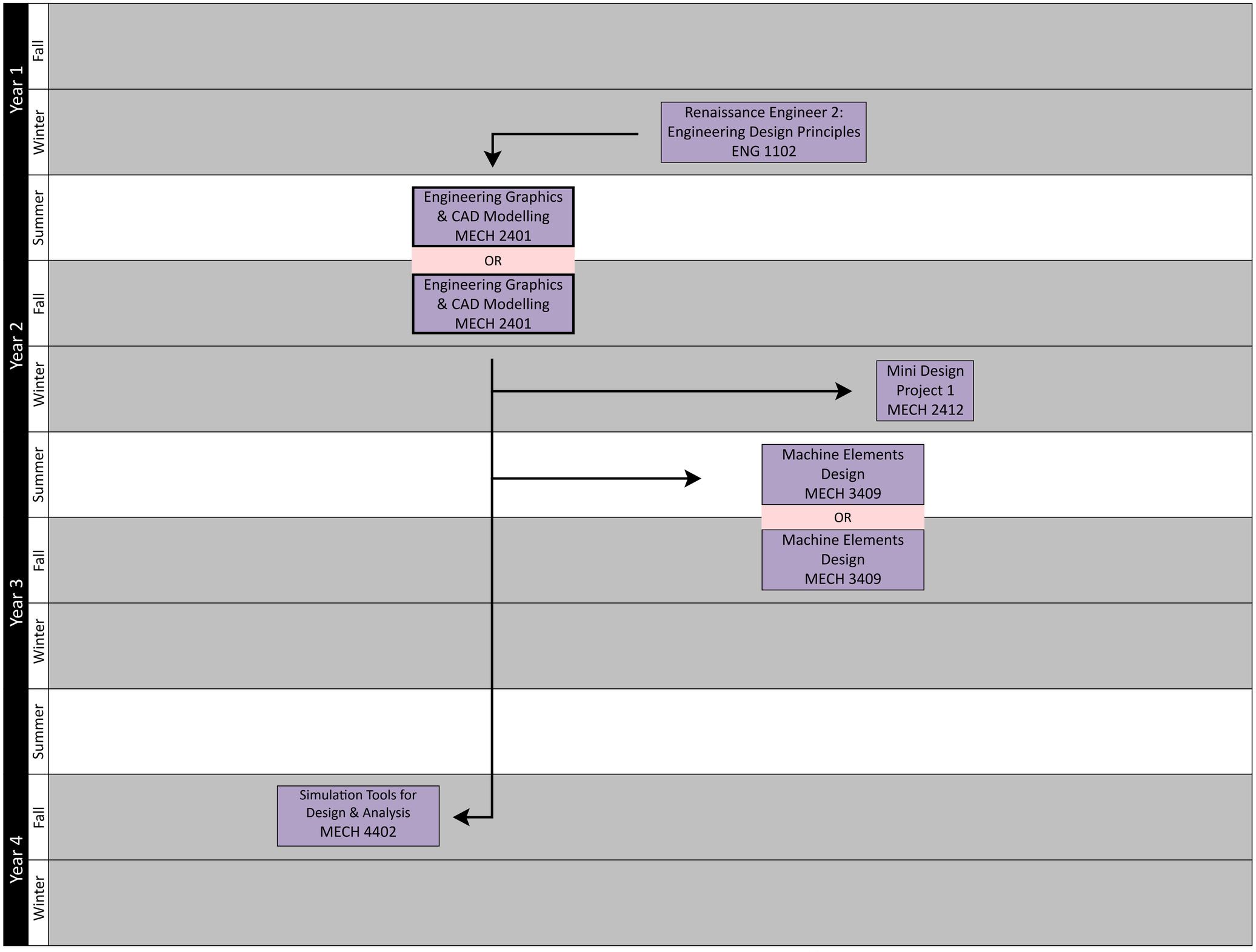

MECH 2401 3.00:
This course discusses technical drawing principles, introduction and application of computer aided design tools, and solid modeling. Simple model parts, which can be assembled together, are fabricated in teams (e.g., using additive technology).

Prerequisites:
LE/ENG 1102 4.00

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
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MECH 2302 3.00 Dynamics

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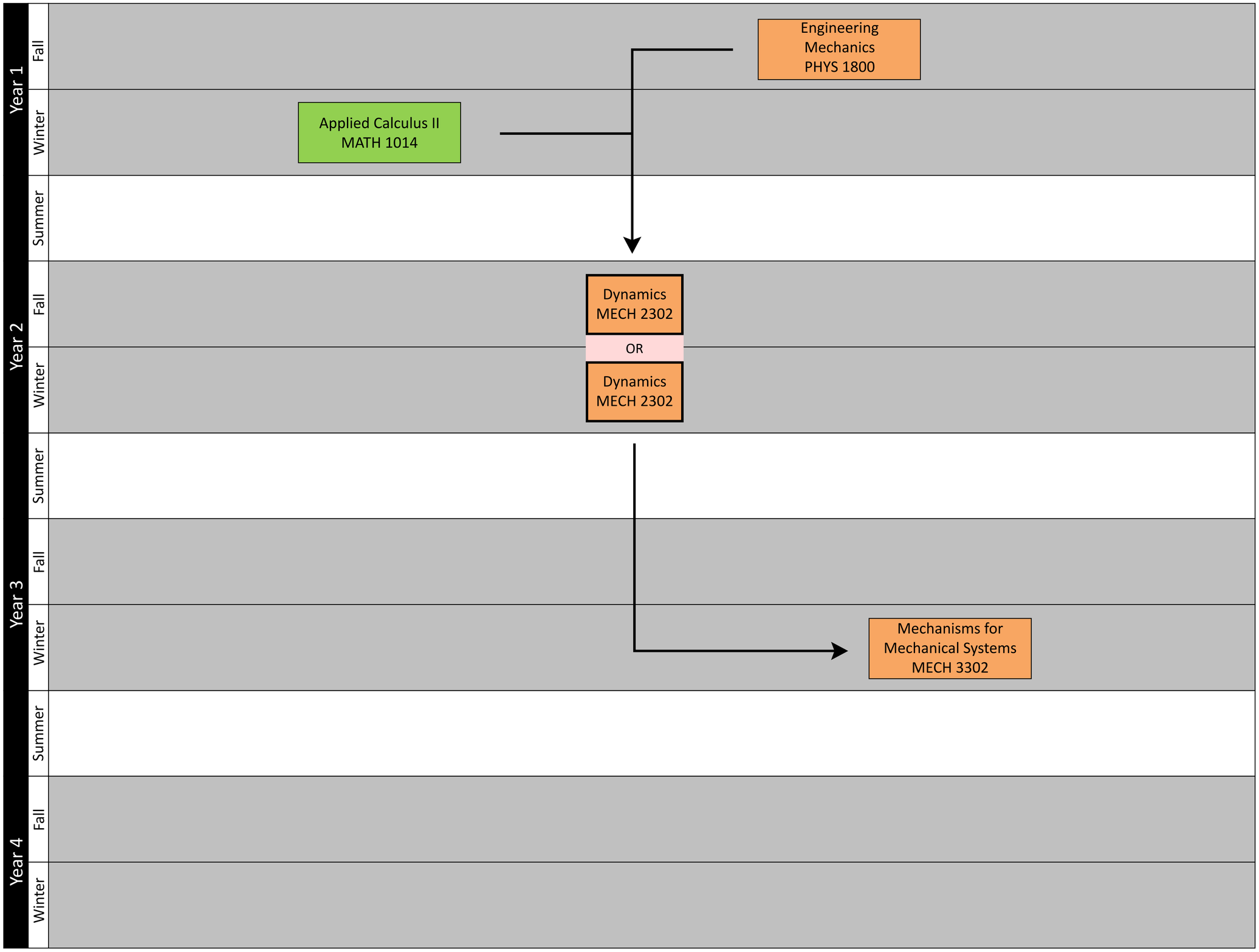

MECH 2302 3.00:
This course covers kinematics and kinetics of rigid body motion (2D and 3D) based on concepts of force, work, momentum and energy methods; impact; mechanical vibrations; engineering applications are emphasized.

Prerequisites:
SC/MATH 1013 3.00,
SC/MATH 1014 3.00,
and SC/PHYS 1800 3.00.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 2502 3.00 Instrumentation and Measurement Techniques

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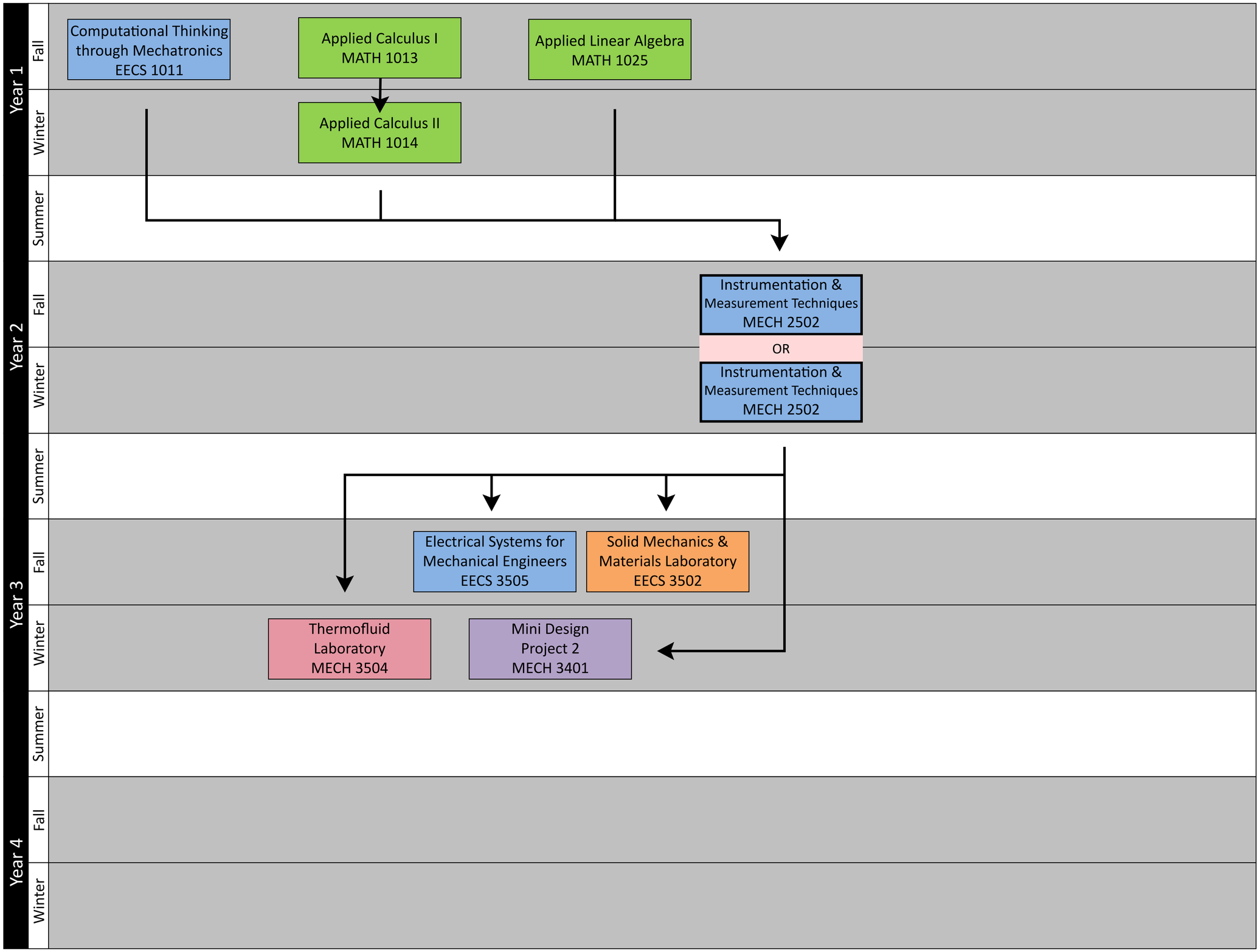

MECH 2502 3.00:
This course covers underlying physics and design of measurement systems for various phenomena, instrumentation systems and computerized data acquisition, as well as data presentation strategies and related statistics.

Prerequisites:
SC/MATH 1013 3.00,
SC/MATH 1014 3.00,
SC/MATH 1025 3.00,
LE/EECS 1011 3.00.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 2301 3.00 Mechanics of Material

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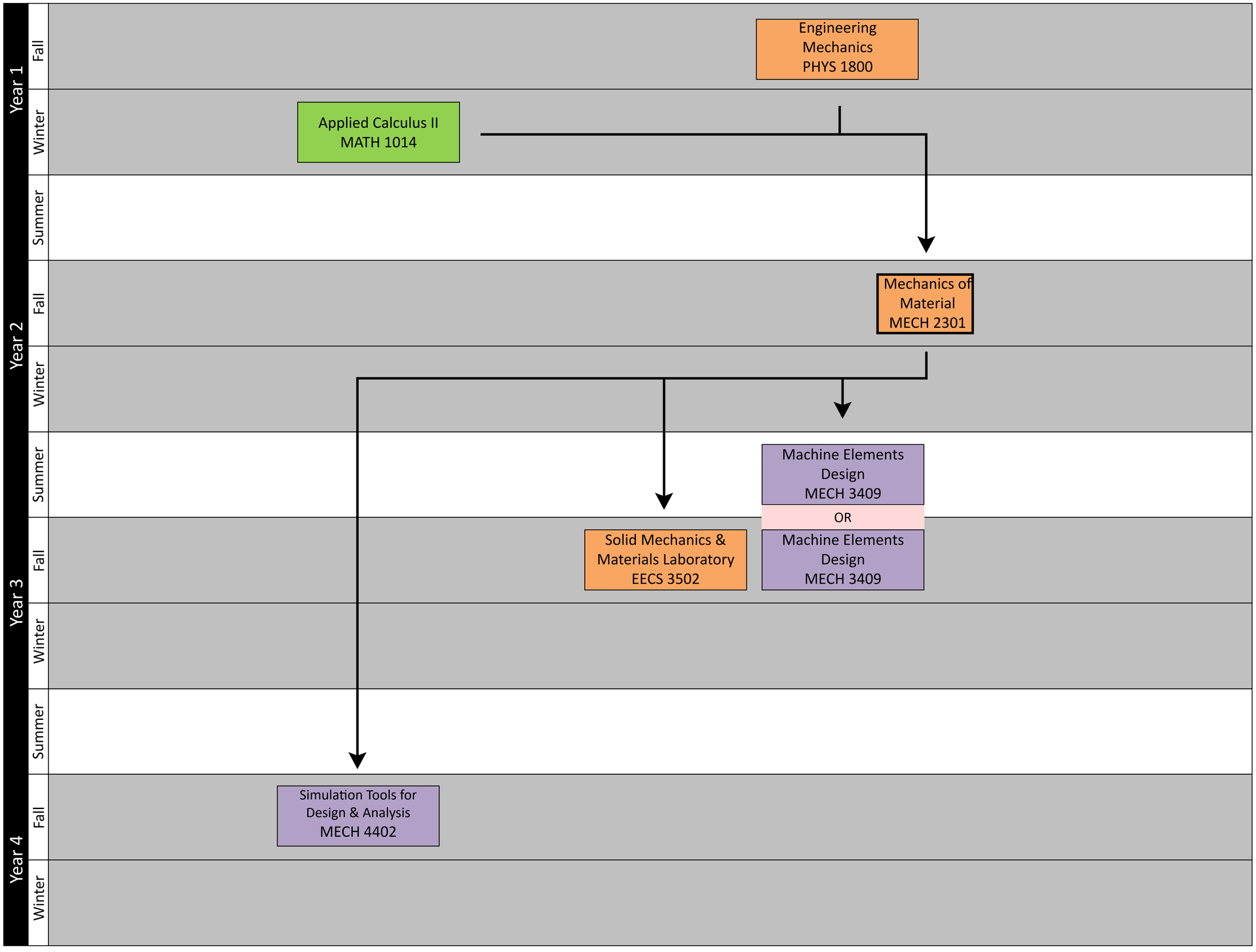

MECH 2301 3.00:
This course covers normal and shear stresses and strains in deformable bodies, axial, torsion loading, multi-axis stress analysis, beam bending and analysis of mechanical systems (e.g., pressure vessels, and buckling of columns; design for strength and deflection of a member).

Prerequisites:
SC/MATH 1013 3.00,
SC/MATH 1014 3.00,
and SC/PHYS 1800 3.00.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

ENG 2001 3.00 Engineering Projects: Management, Economics and Safety

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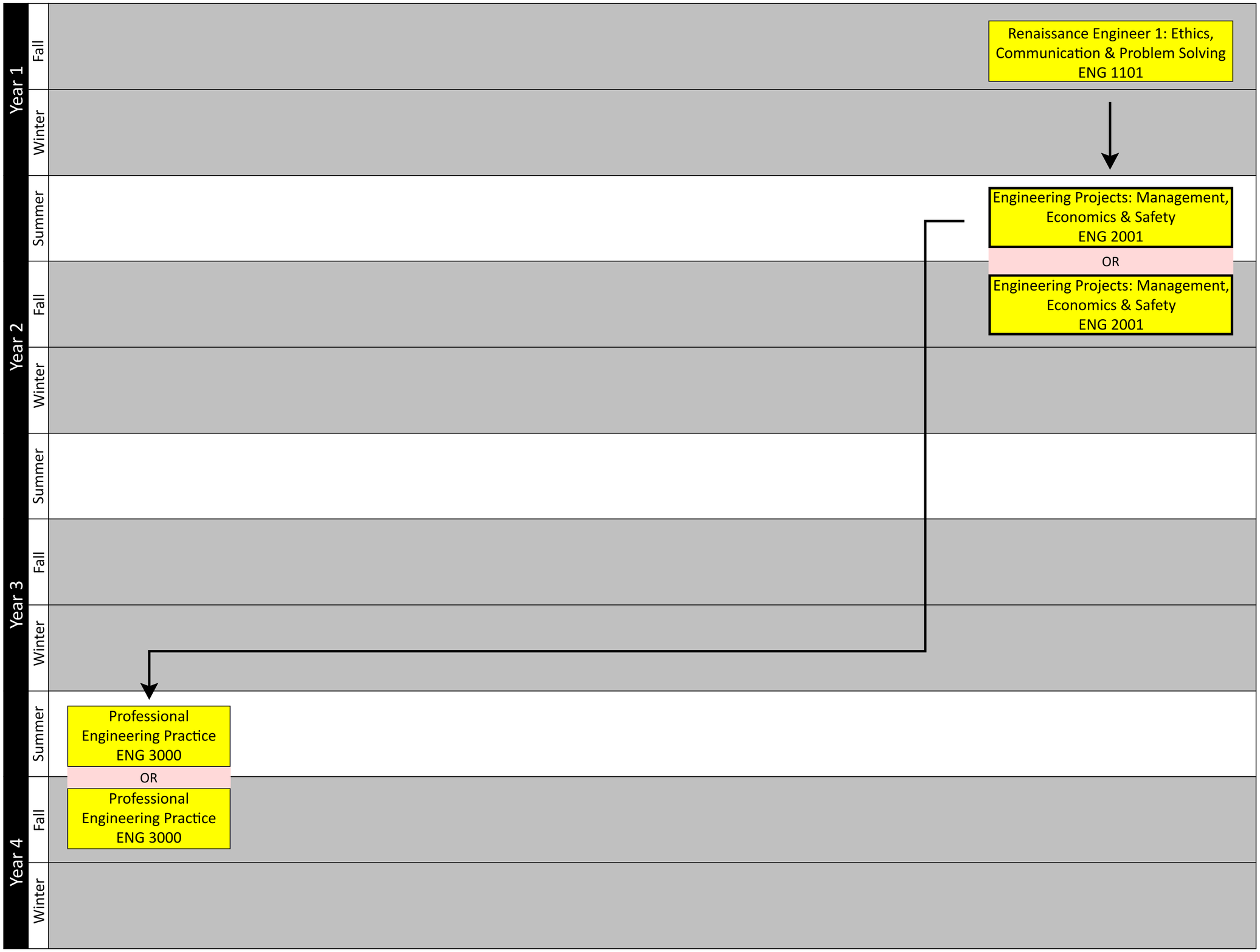

ENG 2001 3.00:
Introduction to the management, economics and safety as they relate to engineering projects, including the following. Project management: work breakdown structures, Gantt charts, logic diagrams and change management. Engineering economics: time value of money, comparison methods, rates of return. Workplace safety. Group design projects.

Prerequisites:
LE/ENG 1101 4.00
or LE/ENG 1000 6.00

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MATH 2271 3.00 Differential Equations for Scientists and Engineers

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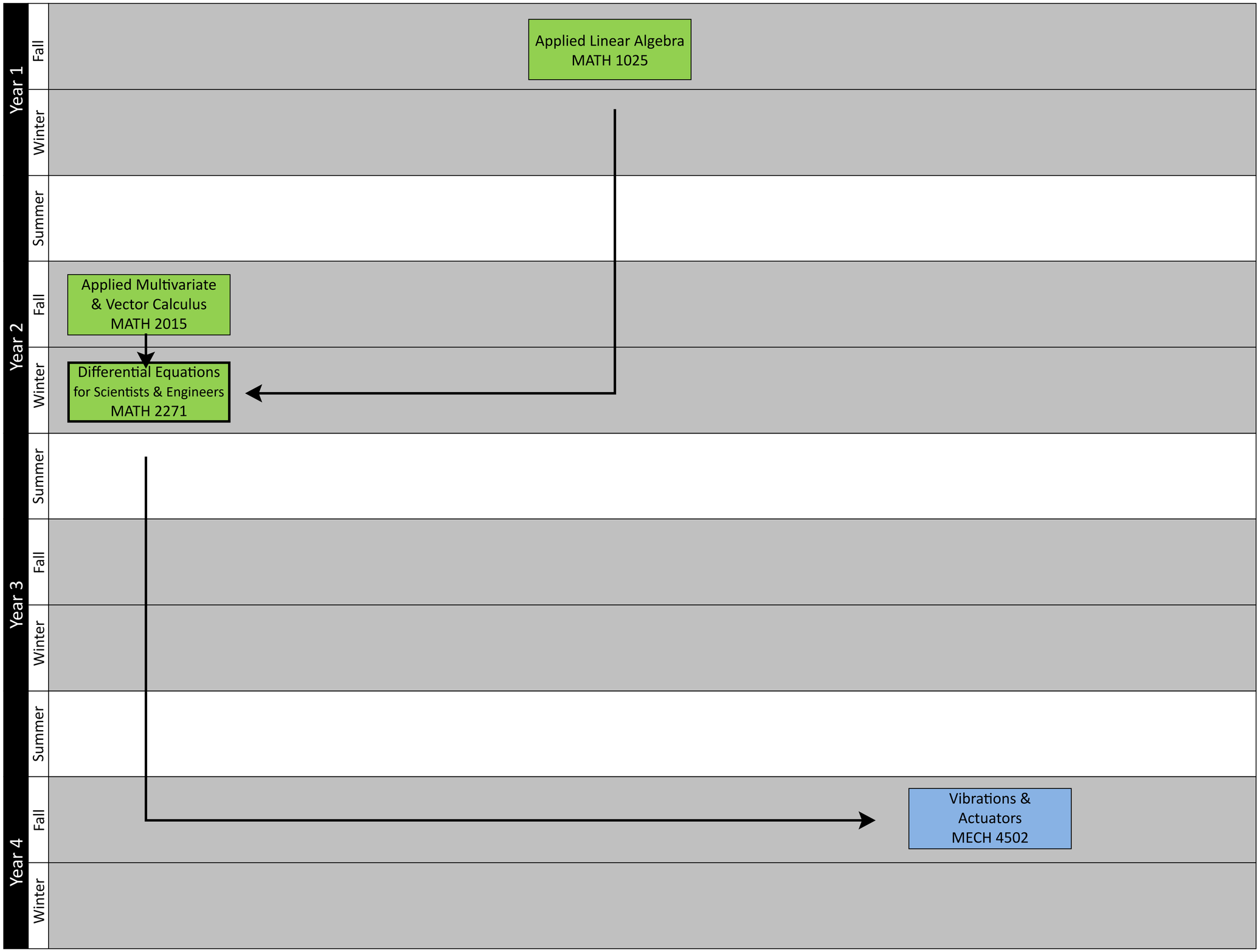

MATH 2271 3.00:
Introduction to ordinary and partial differential equations, including their classification, boundary conditions, and methods of solution. Equations, methods, and solutions relevant to science and engineering are emphasized, and exploration is encouraged with the aid of software. Three lecture hours per week. One term. Three credits.

Prerequisites:
one of
SC/MATH 2015 3.00,
SC/MATH 2310 3.00 or equivalent;
one of
SC/MATH 1025 3.00,
SC/MATH 2022 3.00,
SC/MATH 2222 3.00 or equivalent.

Course credit exclusions:
SC/MATH 2270 3.00,
GL/MATH 3400 3.00.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

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**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MATH 2930 3.00 Introduction to Probability and Statistics

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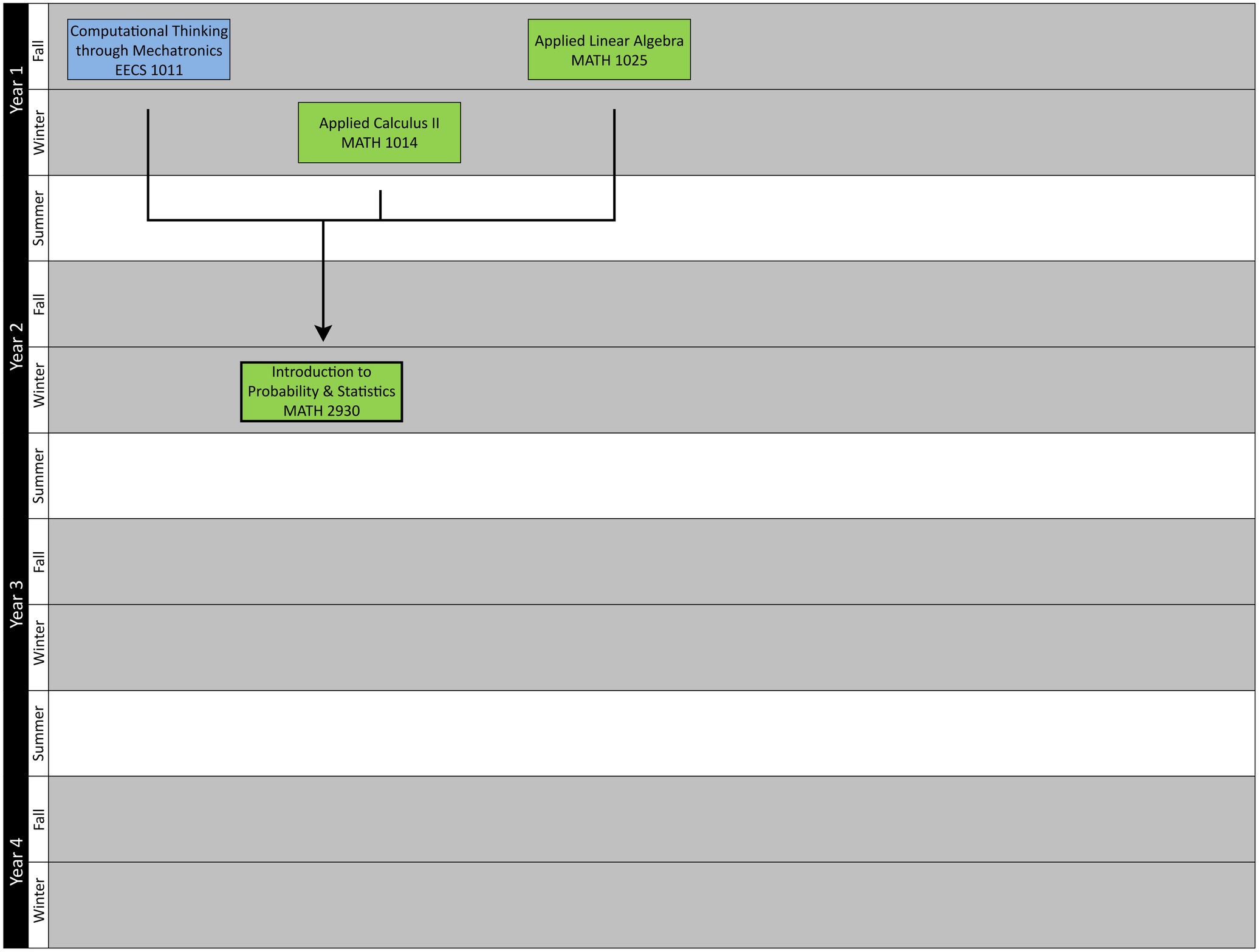

MATH 2930 3.00:
This is an applied probability and statistics course for engineering students. The aim is to provide an application oriented introduction to probability and statistics. The examples will be from a wide selection of engineering disciplines. The probability component is about 30% of the lectures. About 40% of the time, the lectures and tutorials focus on solving practical statistical problems that emerge from engineering problems.

Prerequisites:
SC/MATH 1014 3.00 or equivalent;
SC/MATH 1025 3.00 or equivalent;
LE/EECS 1011 3.00 or equivalent.

Course credit exclusions:
SC/MATH 1131 3.00;
SC/MATH 2560 3.00;
SC/MATH 2570 3.00;
SC/MATH 2565 3.00.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

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**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 2202 3.00 Heat and Flow Engineering Principles

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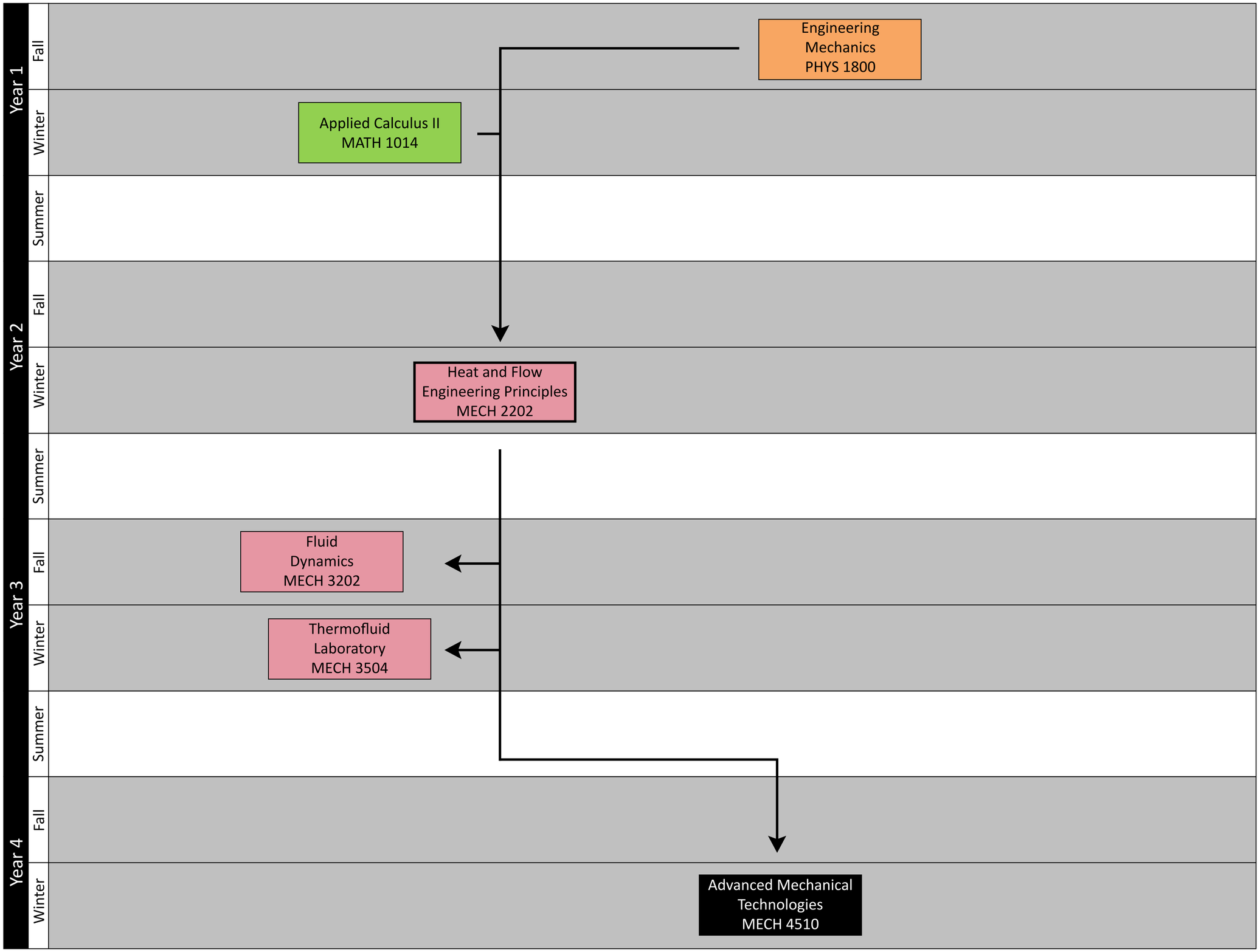

MECH 2202 3.00:
This course covers introduction to modes of heat transfer, 1D heat conduction fluids, properties of fluids, principles of fluid mechanics, fluid statics and internal flows, surface tension and capillarity.

Prerequisites:
SC/MATH 1013 3.00,
SC/MATH 1014 3.00,
and SC/PHYS 1800 3.00.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

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**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 2412 3.00 Mini Design Project 1

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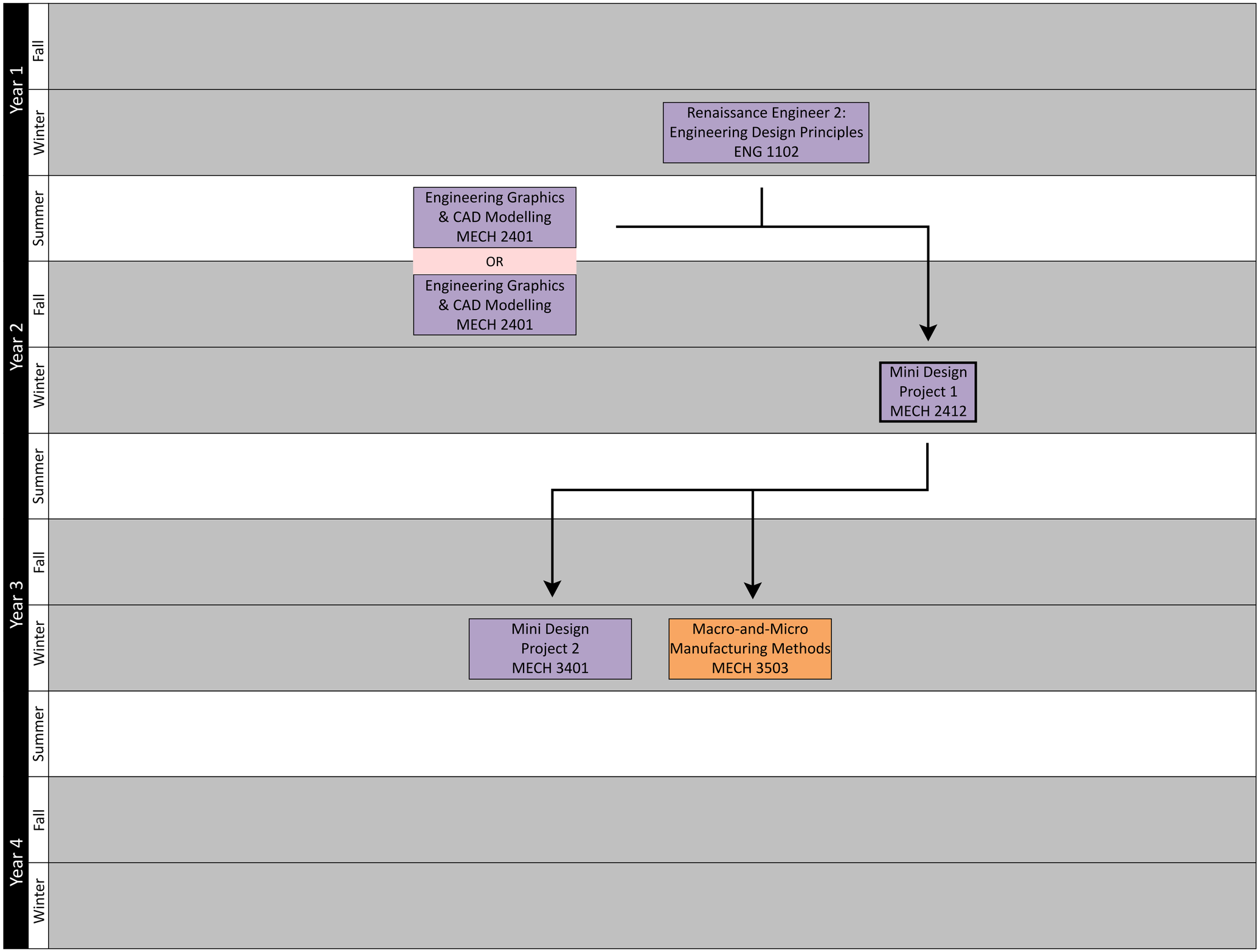

MECH 2412 3.00
The course consists of two main modules. The first module covers workshop safety, and introduces and practices of various subtractive manufacturing methods (e.g., cutting, drilling, machining). The second module includes a review of the design process, project planning techniques, and effective project and team management skills. The student will work in teams and will apply the fundamental concepts of the design process through completing a mini design project.

Prerequisites:
LE/ENG 1102 4.00,
LE/MECH 2401 3.00.

Course credit exclusions:
LE/MECH 2402 2.00,
LE/MECH 2501 2.00.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

ENG 2003 3.00 Effective Engineering Communication

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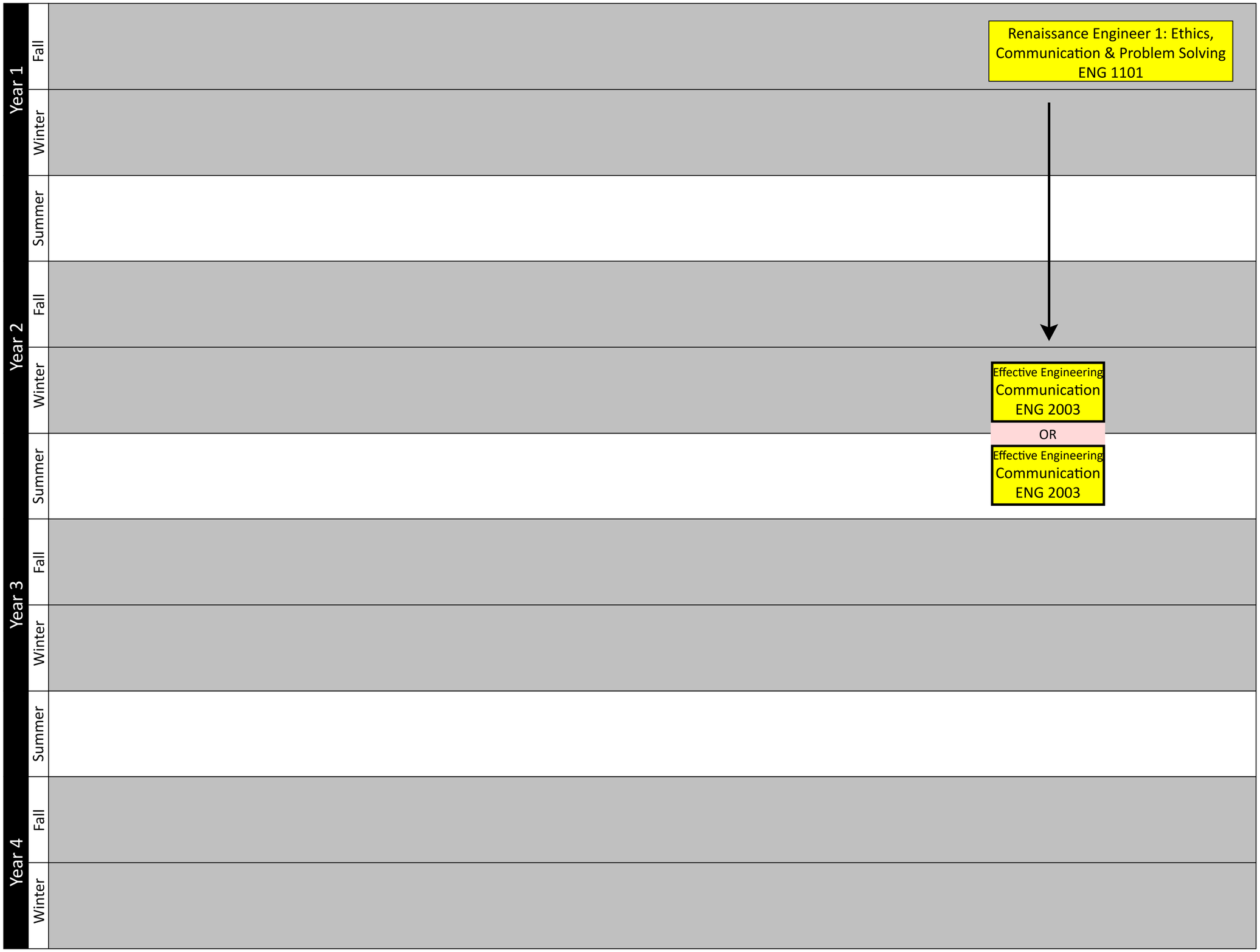

ENG 2003 3.00:
Students learn to effectively employ communication strategies essential to a successful engineering career, including the social, rhetorical, ethical, and practical aspects of professional communications. The focus is on building individuals' confidence and judgment through communications assignments based on case studies.

Prerequisites:
LE/ENG 1101 4.0

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

Complementary Elective 1

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1	Fall	
	Winter	
	Summer	
Year 2	Fall	
	Winter	Complementary Elective 1
	Summer	
Year 3	Fall	Complementary Elective 2
	Winter	
	Summer	
Year 4	Fall	Complementary Elective 3
	Winter	Complementary Elective 4

Course Info:
A total of 12 credits of complementary studies courses must be taken, as identified thematic areas described in the Academic Calendar. At least 3 of the 12 credits must be taken in the humanities or social sciences, defined by the following areas: Anthropology, Humanities, English, History, Linguistics and Languages, Philosophy, Social Science, Modes of Reasoning and Women's Studies.

For more details go to calendars.registrar.yorku.ca and select the most current academic calendar year. On the left hand side under "ACADEMIC CALENDARS" select "programs by Faculty" and select "Lassonde School of Engineering."

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 3201 3.00 Engineering Thermodynamics

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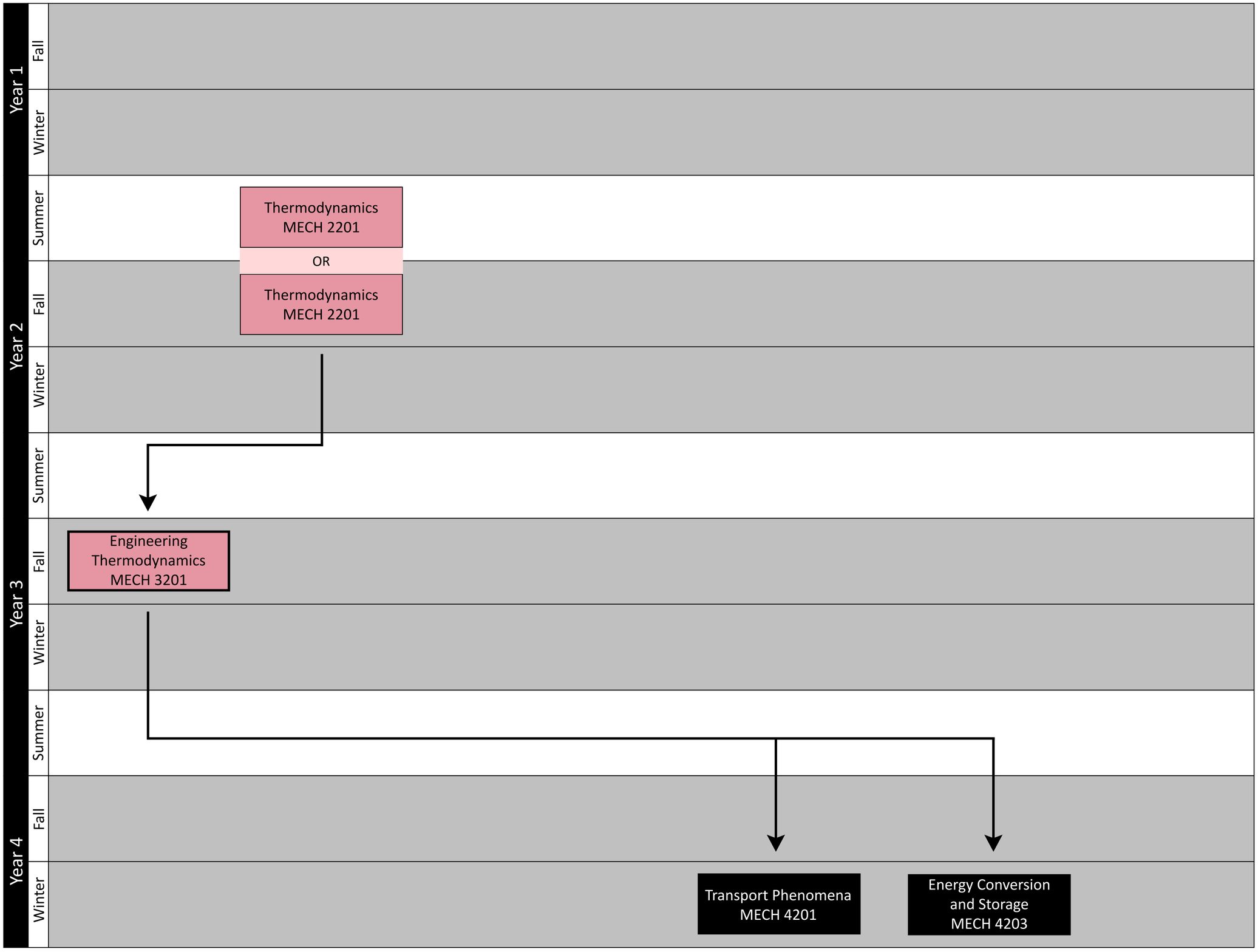

MECH 3201 3.00:
This course continues the learning in thermodynamics, including topics such as: Analysis and application of energy compression cycles, vapor compression cycles and application to HVAC systems; combustion and/or compressible gas flow in conduits (adiabatic and isothermal). Students will examine the various implications of the laws of thermodynamics in complex systems relevant to mechanical engineering.

Prerequisites:
MECH 2201 3.00

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

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**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 3202 3.00 Fluid Dynamics

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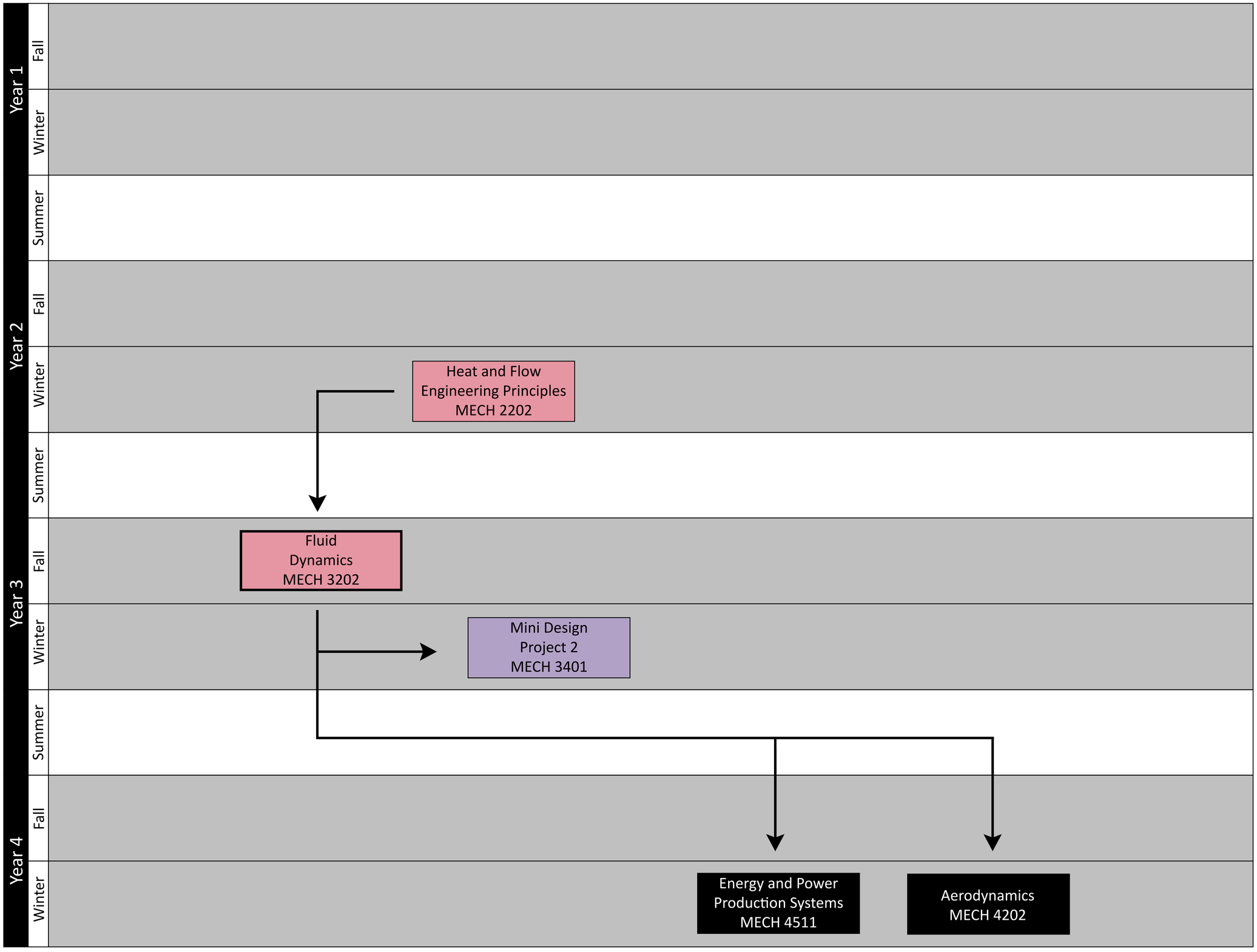

MECH 3202 3.00:
Introduces key concepts and methods in solving problems in fluid mechanics. Topics covered include: External flow; boundary layers; momentum theories; similitude; fluid friction, drag and lift; fluid friction in pipes and minor losses; fluid machineries; pipe networks; time permitting flow at high Reynolds numbers including shock waves and/or turbulence. Students will formulate models that are needed to analyze and design fluid systems, and demonstrate strong problem solving skills appropriate to the engineering practice.

Prerequisites:
LE/MECH 2202 3.0

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

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MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

EECS 3505 3.00 Electrical Systems for Mechanical Engineers

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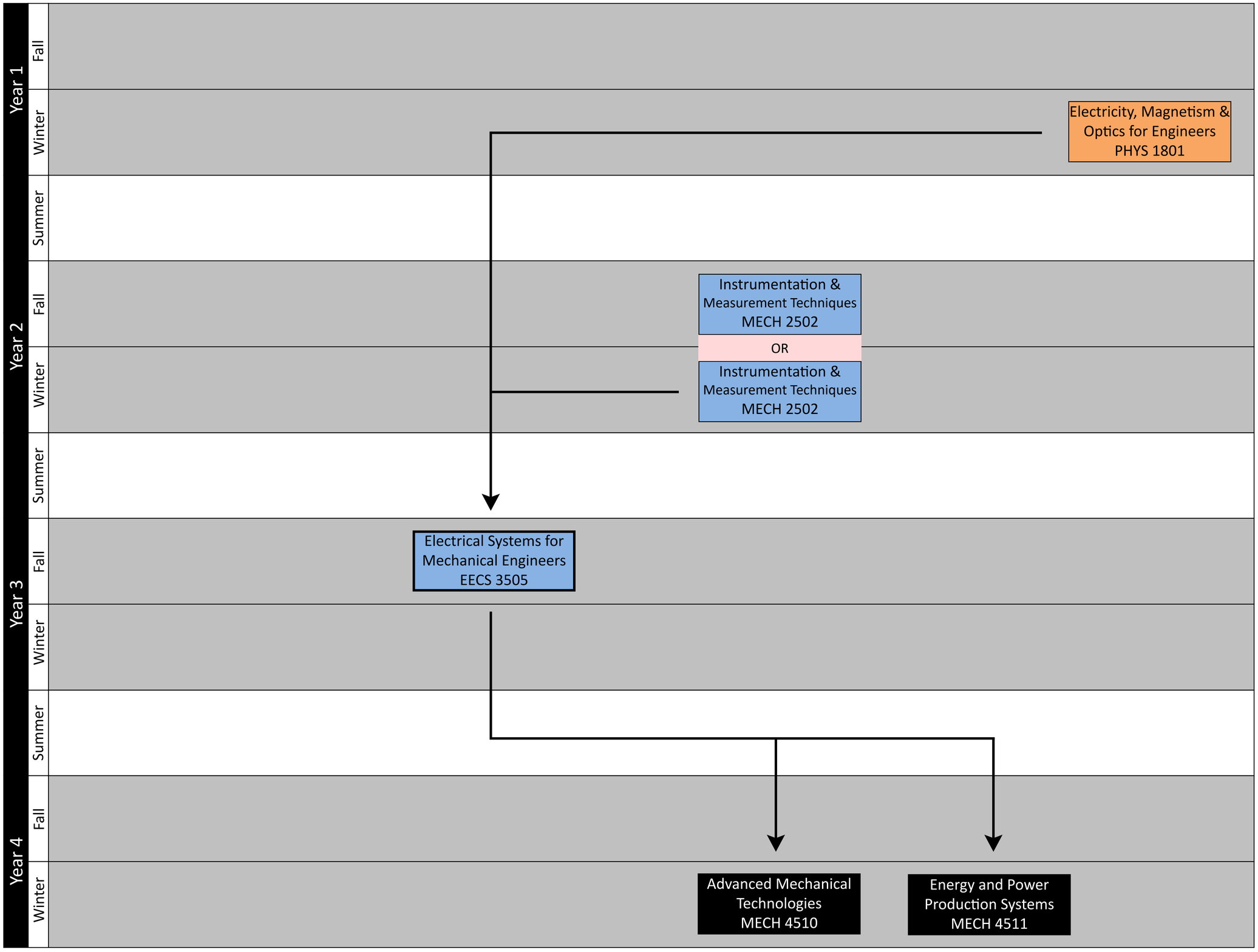

EECS 3505 3.00:
Many mechanical systems today are integrated with electrical systems. This course will prepare students to work on electromechanical systems by introducing them to topics such as: The basics of circuit analysis and setup, as well as electronics; power systems including 3-phase; DC and AC motors; electro-mechanical actuators; and, time permitting, basics of communication protocols.

Prerequisites:
SC/PHYS 1801 3.00,
LE/MECH 2502 3.00.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

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**** Technical electives**
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MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

EECS 3502 3.00 Solid Mechanics and Materials Laboratory

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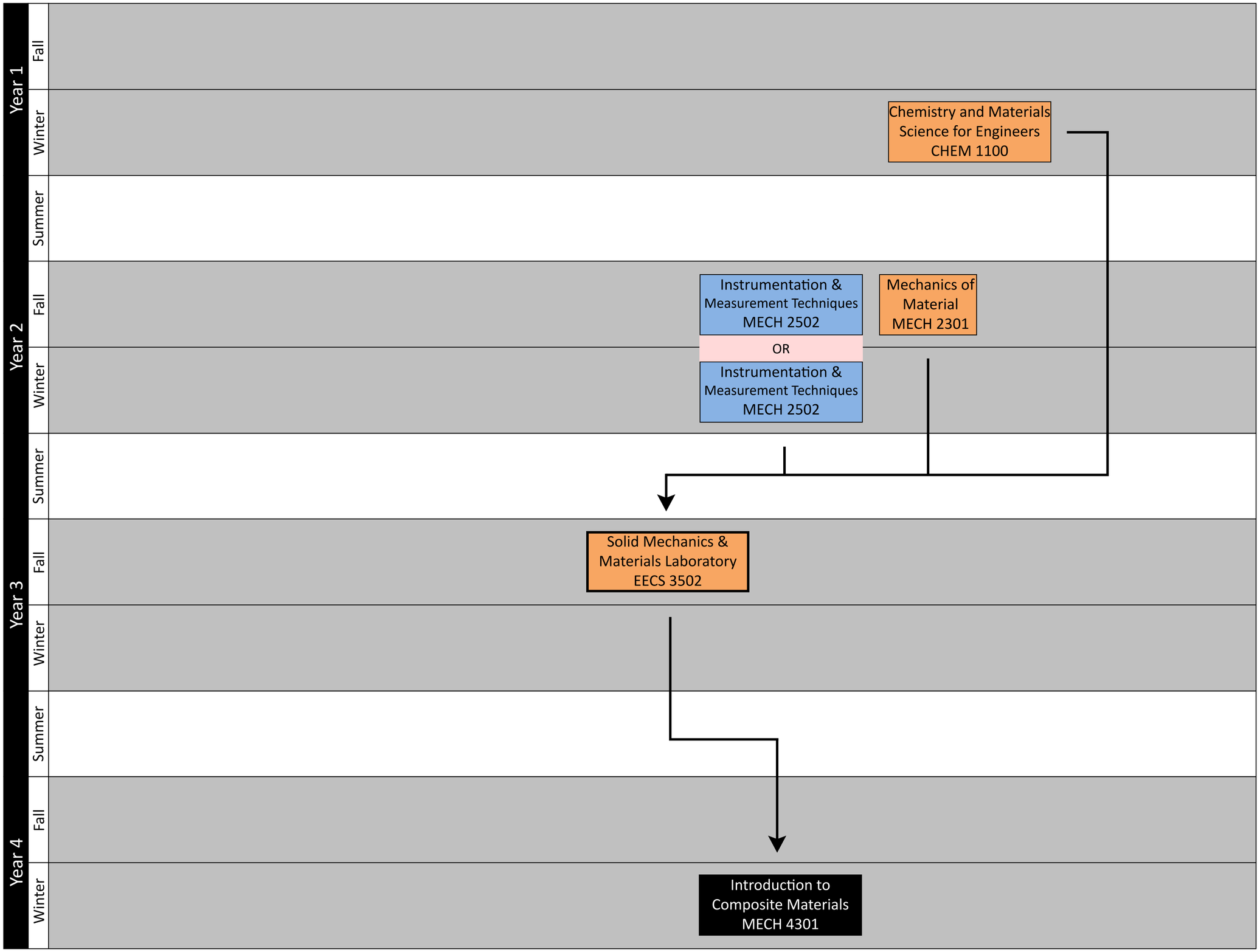

EECS 3502 3.00:
Building on the foundational knowledge in the mechanics of materials, this course introduces students to a number of measurement and characterization methods used for macro- and micro-systems. A selected number of laboratory experiments and demonstrations may include: strain measurements (e.g. strain gauges and/or speckles & interferometry method), deflection measurements, hardness, impact, non-destructive testing method for crack detection; material characterization methods including techniques such as SEM, AFM, nano-indentors, etc.; motion measurements, traditional and optical (using imaging methods, e.g. by a cell phone camera). Students will continue to develop their skills in data collection, analysis, and the presentation of findings.

Prerequisites:
SC/CHEM 1100 4.00;
LE/MECH 2301 3.00;
LE/MECH 2502 3.00.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 3409 3.00 Machine Elements Design

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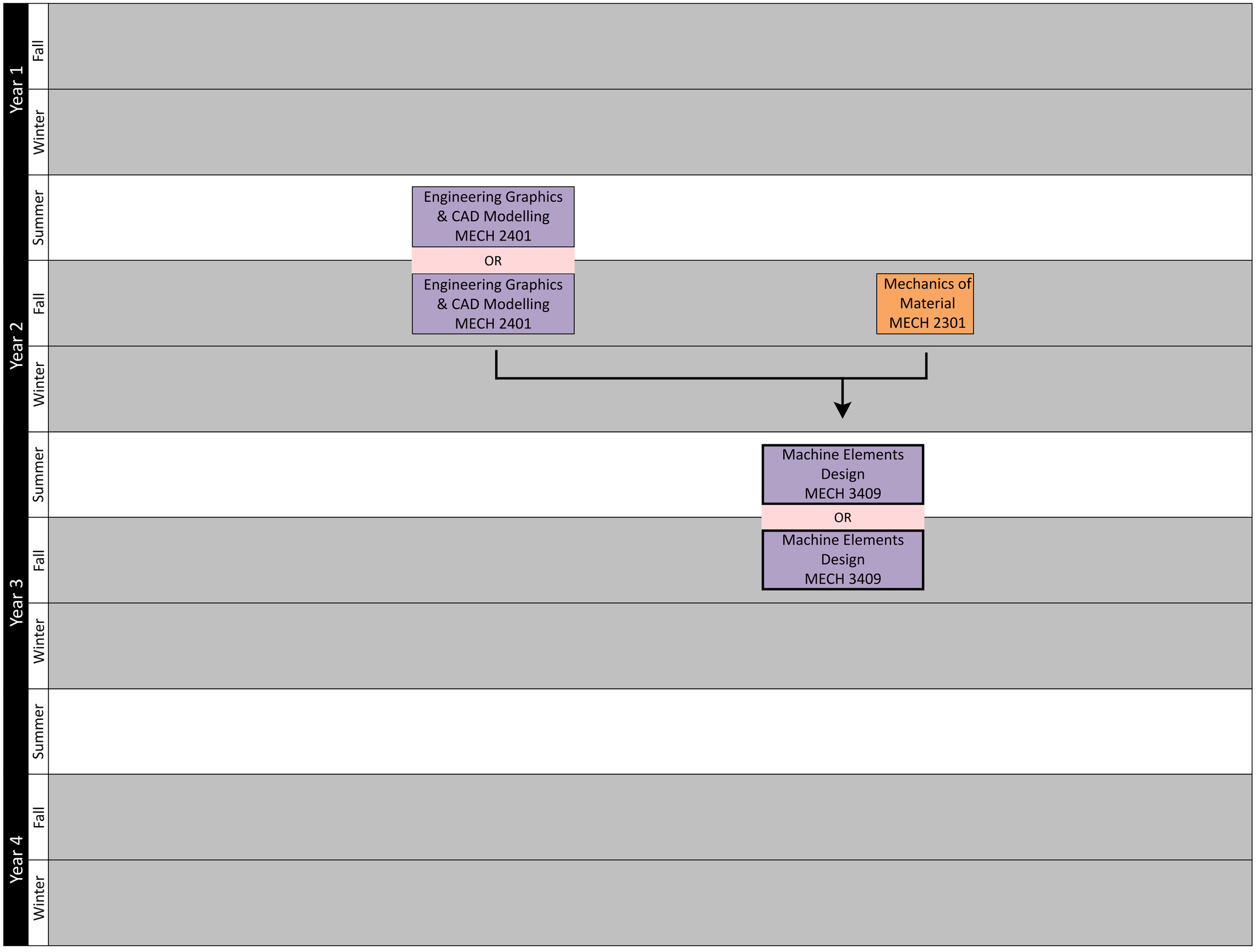

MECH 3409 3.00:
Introduces methodology for mechanical design of components. It discusses topics including design for static and dynamic loads, failure analysis. fatigue, component design and selection for materials and machine elements, e.g. threaded joints, springs, gears, belt, chain, bearings, etc.

Prerequisites:
LE/MECH 2301 3.00,
LE/MECH 2401 3.00.

Course credit exclusions:
LE/MECH 2409 3.00

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

ESSE 2210 3.00 Engineering and the Environment

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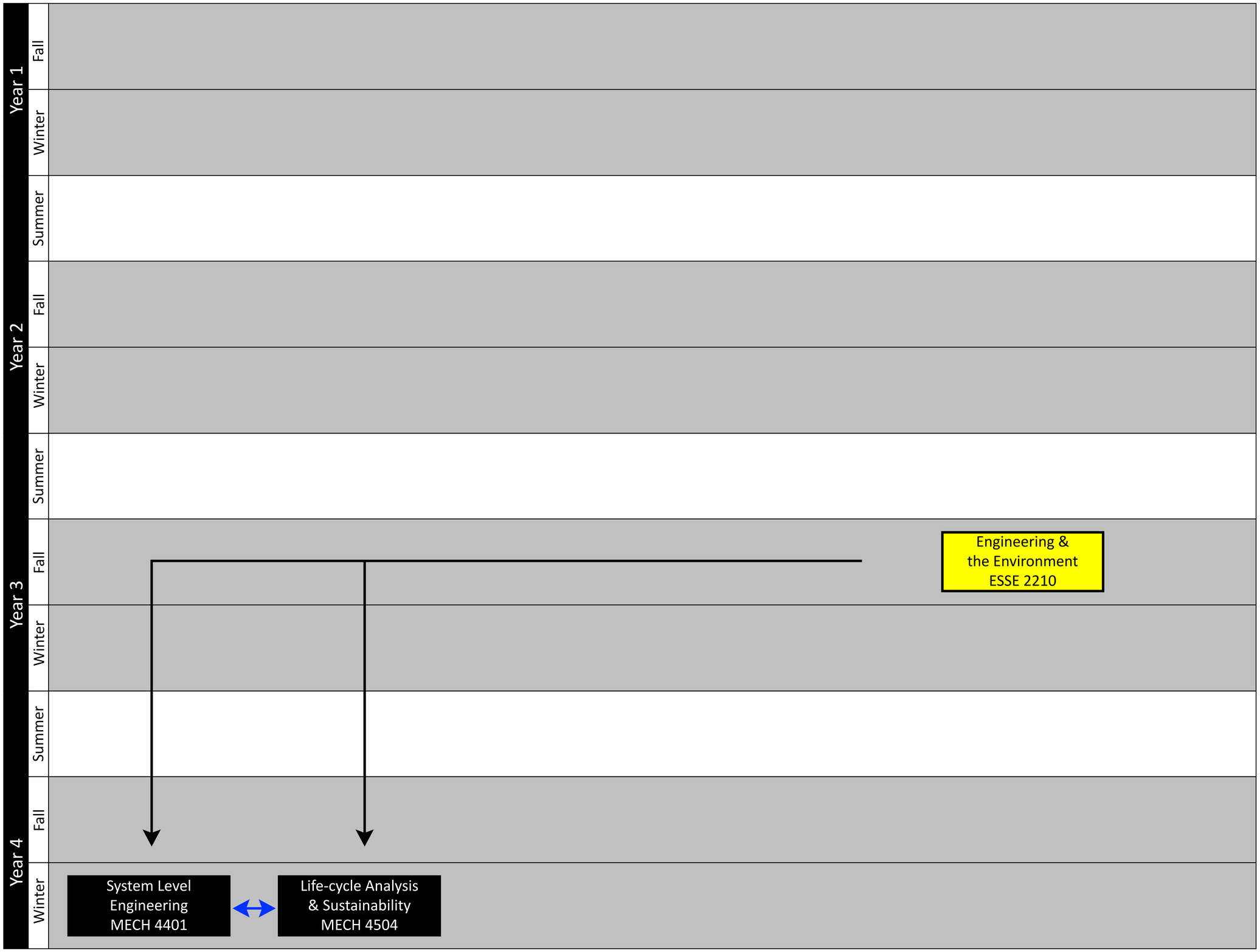


ESSE 2210 3.00:
This course surveys a variety of Canadian case studies in environmental sustainability from an engineering perspective. The goal of this course is to provide students with exposure to the social aspects of large infrastructure projects, including the environmental assessment and stakeholder consultation processes. Climate change mitigation and adaptation are strong themes of this course.

Prerequisites: None.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

Complementary Elective 2

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1	Fall	
	Winter	
	Summer	
Year 2	Fall	
	Winter	Complementary Elective 1
	Summer	
	Fall	Complementary Elective 2
Year 3	Winter	
	Summer	
	Fall	Complementary Elective 3
Year 4	Winter	Complementary Elective 4

Course Info:
A total of 12 credits of complementary studies courses must be taken, as identified thematic areas described in the Academic Calendar. At least 3 of the 12 credits must be taken in the humanities or social sciences, defined by the following areas: Anthropology, Humanities, English, History, Linguistics and Languages, Philosophy, Social Science, Modes of Reasoning and Women's Studies.

For more details go to calendars.registrar.yorku.ca and select the most current academic calendar year. On the left hand side under "ACADEMIC CALENDARS" select "programs by Faculty" and select "Lassonde School of Engineering."

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

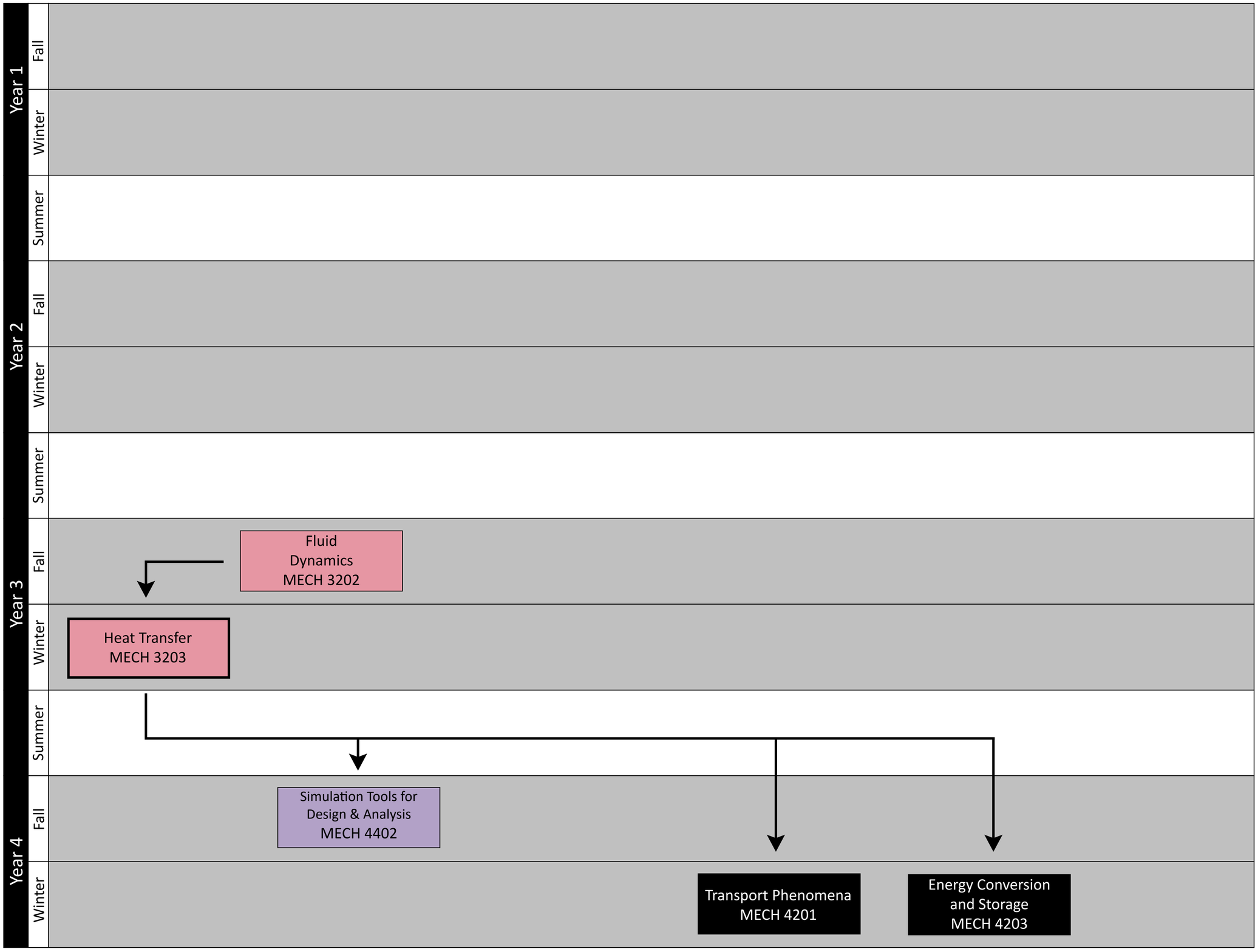
* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 3203 3.00 Heat Transfer

"CLICK" item to go back to PROGRAM OVERVIEW



MECH 3203 3.00:
This course will develop students' understanding and problem solving skills in topics of heat transfer, including: Steady and unsteady heat conduction (exact and numerical analysis); free and forced convection (internal and external); heat exchangers; thermal radiation; heat transfer with phase change. Students will extend their knowledge previously learnt in Heat and Flow Engineering Principles and Fluid Mechanics to solve engineering problems.

Prerequisites:
MECH 3202 3.00

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

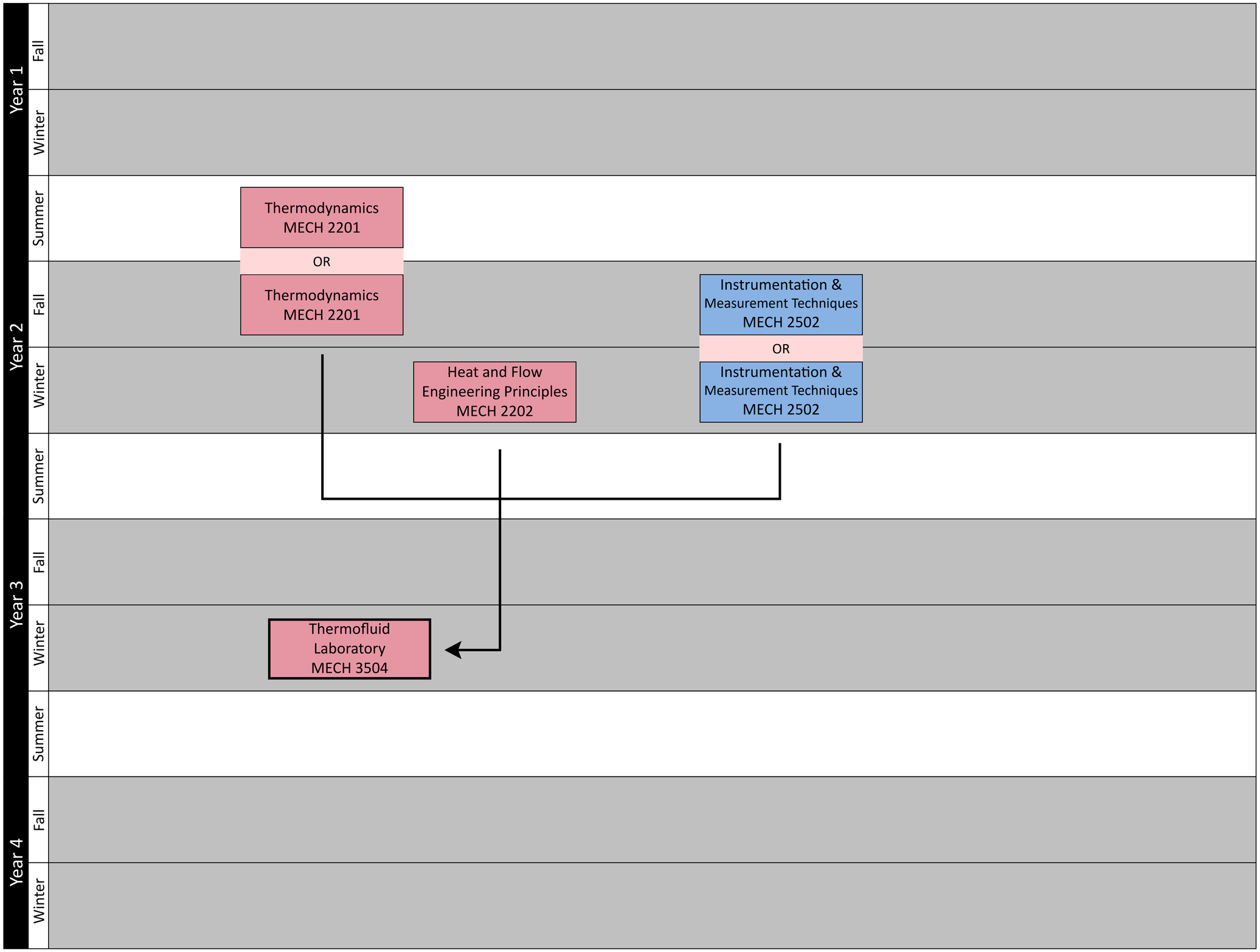
* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 3504 3.00 Thermofluid Laboratory

"CLICK" item to go back to PROGRAM OVERVIEW



MECH 3504 3.00:
Building on the foundational knowledge of thermodynamics and basic skills in instrumentation, this course will provide students with an in-depth experience in measurement methods used in micro- and macro-systems. A select number of laboratory experiments and demonstrations will deal with thermodynamics (e.g. power cycles, or heat pumps), fluid mechanics (flow in the pipes and losses), fluid machines (e.g. pumps or fans), flow measurements techniques (e.g. from traditional to advanced optical systems e.g. PIV), conduction/ convective and radiation heat transfer, heat exchangers, etc. Safety practices in laboratory environment are reinforced.

Prerequisites:
LE/MECH 2201 3.00;
LE/MECH 2202 3.00;
LE/MECH 2502 3.00.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

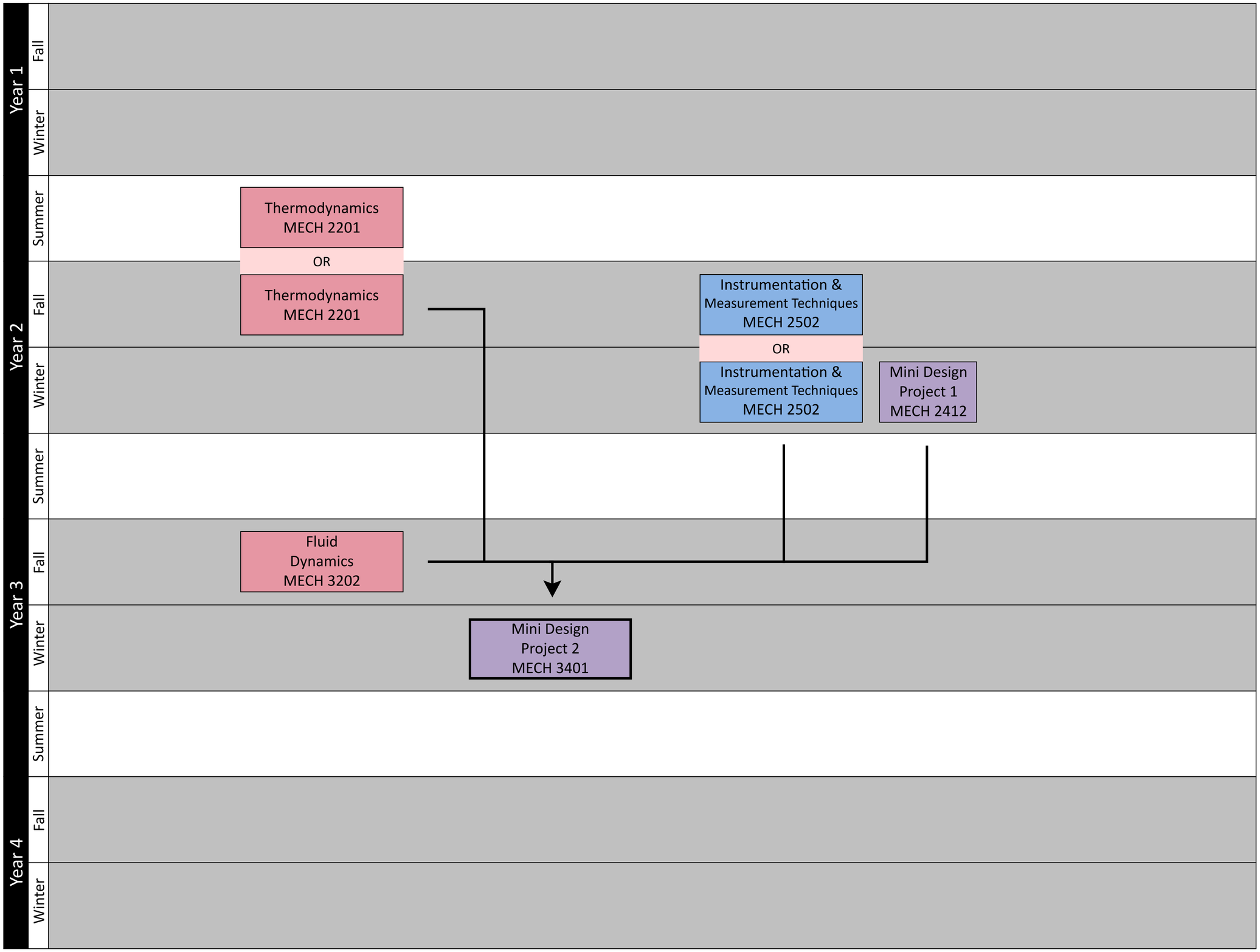
* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 3401 3.00 Mini Design Project 2

"CLICK" item to go back to PROGRAM OVERVIEW



MECH 3401 3.00:
This project-based course involves a semester-long team project that is limited in scope, but open-ended and/or requiring multiple solutions. Students will also practice advanced machining techniques and apply them to fabricate parts in their projects. Lecture sessions are designed to provide complementary training in different areas of project execution such that students will be well prepared to succeed in their final year capstone project. Students have the option of choosing a project in any area of mechanical engineering; they are also encouraged to work in partnership with industry, consult a practicing engineer, and/or collaborate with students from a technical college. Evaluation criteria include written and oral communications of technical solutions, as well as economic analysis and/or other analyses related to entrepreneurial opportunities.

Prerequisites:
LE/MECH 2201 3.00;
LE/MECH 2412 3.00
or LE/MECH 2402 2.00;
LE/MECH 2502 3.00;
LE/MECH 3202 3.00.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

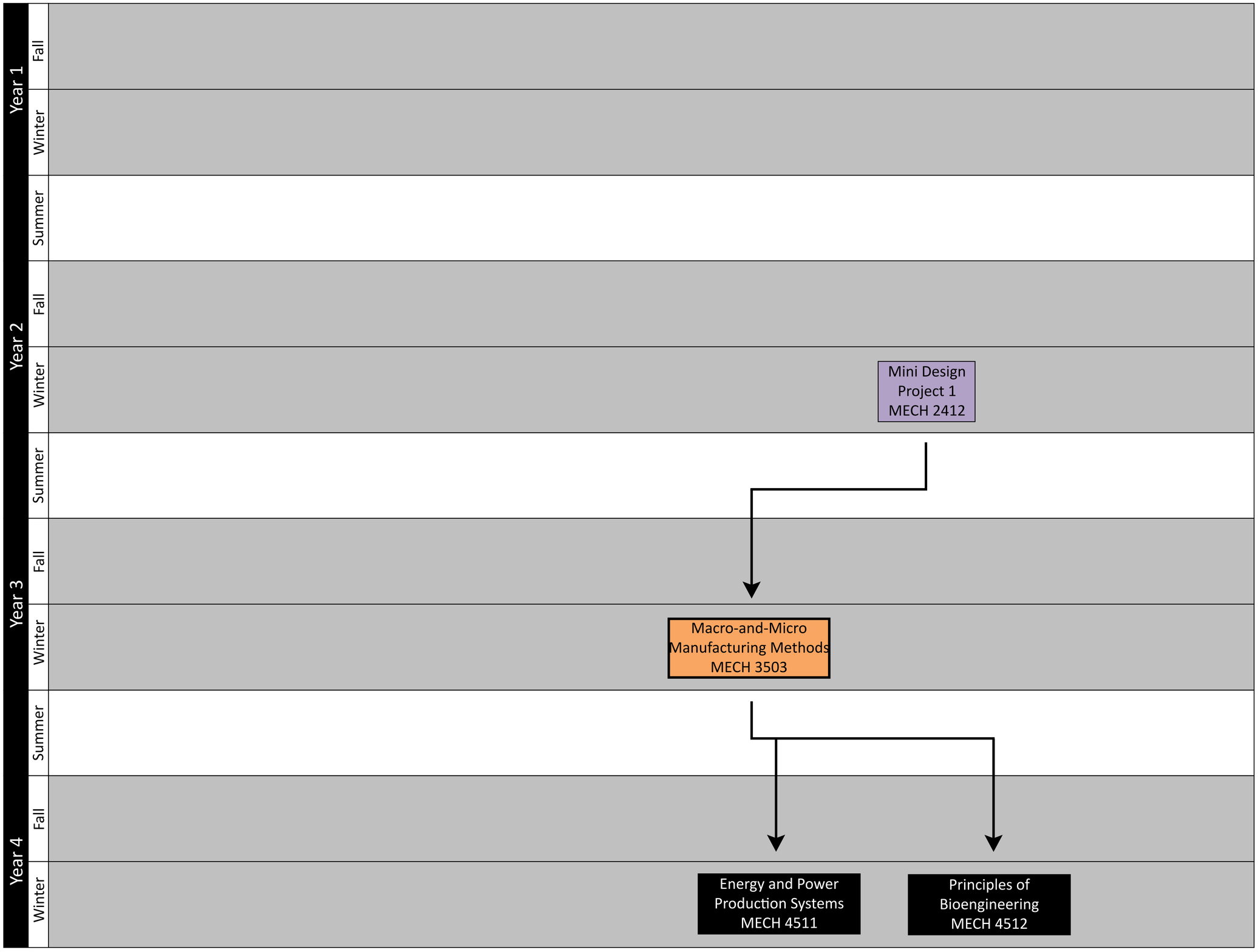
* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 3503 3.00 Macro-and-Micro Manufacturing Methods

"CLICK" item to go back to PROGRAM OVERVIEW



MECH 3503 3.00:
The ever-expanding range of scale in manufacturing presents unique challenges for engineers and manufacturers. This course will introduce students to the traditional macro-manufacturing methods and existing micro-manufacturing methods. Macro-manufacturing methods may include casting, forming and forging, machining (e.g. CNC and EDM), injection molding, additive manufacturing, treatments (heat, shot pinning, etc.). Micro-manufacturing methods will include those based on silicon, thin film and polymer technologies; Current trends and issues will be explored during selected field trips, laboratory visits, and/or through in-class activities.

Prerequisites:
LE/MECH 2412 3.00

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 3302 3.00 Mechanisms for Mechanical Systems

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1
- Fall
- Winter
- Summer

Year 2
- Fall: Dynamics MECH 2302
- Winter: OR Dynamics MECH 2302
- Summer

Year 3
- Fall
- Winter: Mechanisms for Mechanical Systems MECH 3302
- Summer

Year 4
- Fall: Vibrations & Actuators MECH 4502
- Winter

MECH 3302 3.00:
This course covers topics including classifications of mechanisms; velocity, acceleration and force analysis (e.g., for linkages, cranks, sliders, and cams); balancing of rotating and reciprocating machinery; gears and gear-trains; graphical and computer-oriented methods of analysis for mechanisms; applications of different mechanisms in mechanical systems (e.g., engines, manufacturing systems).

Prerequisites:
LE/MECH 2302 3.00

Course credit exclusions:
LE/ESSE 3340 3.00

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

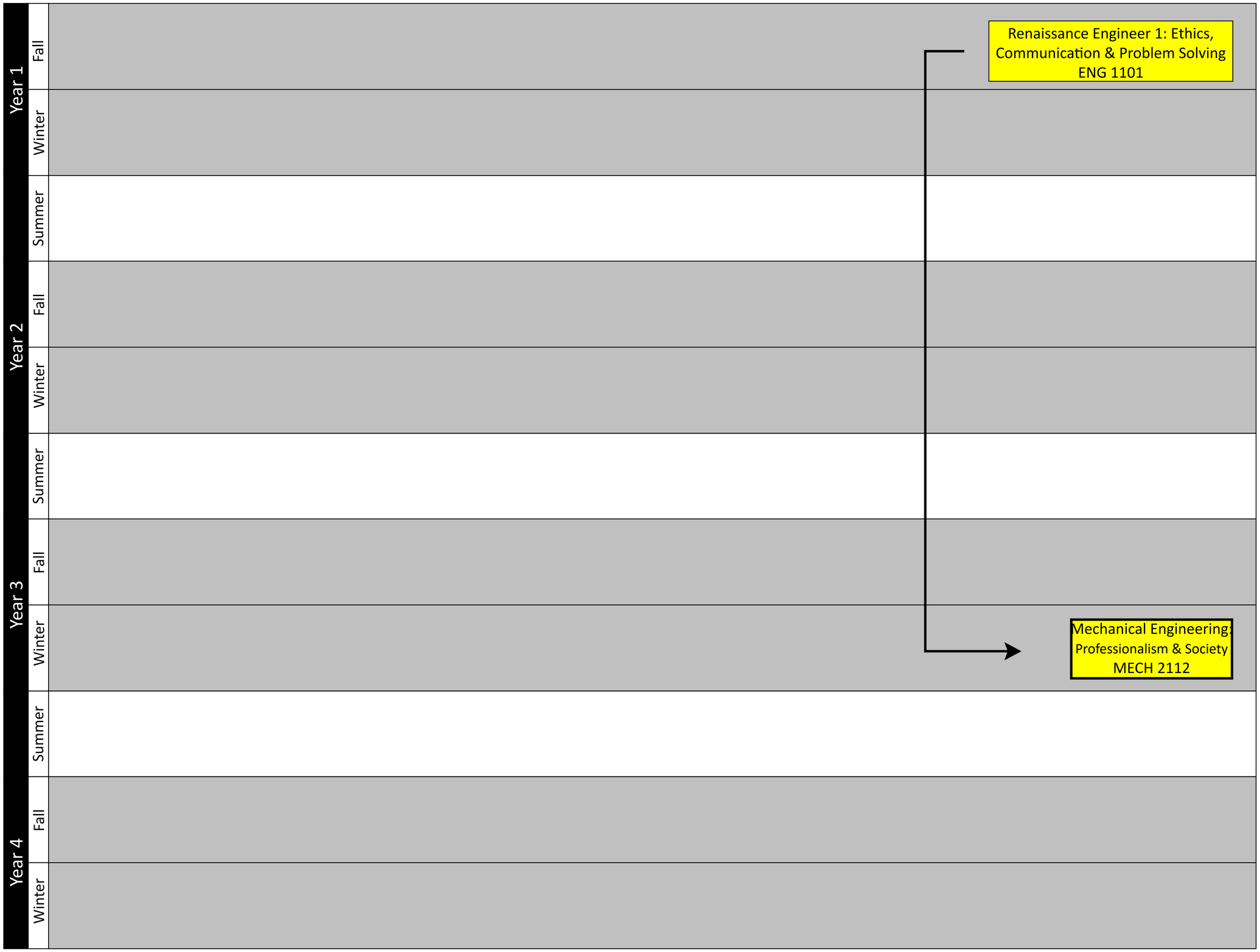
* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 2112 3.00 Mechanical Engineering: Professionalism and Society

"CLICK" item to go back to PROGRAM OVERVIEW



MECH 2112 3.00:
In this course, students explore their role in the profession of mechanical engineering and the relationship between mechanical engineering and society. Students learn about the role of engineering in society, human-centred design principles, working with communities, and technological stewardship principles. These are applied through a major project completed outside of the classroom (e.g. in partnership with a local community or external organization). The course also focuses on various career paths and opportunities, e.g. options in government, private industry, not-for-profit sector, graduate education, entrepreneurial opportunities and technology protection. Students are required to build their professional network, for example, through attending networking events and conducting informational interviews. Finally, this course discusses the professional matters including the value of diversity, allyship in the workplace, life-long learning strategies, working in teams, and giving & receiving feedback. Guest lecturers from industry and other appropriate bodies will be used to provide a firsthand knowledge from practicing engineers and other professionals.

Prerequisites:
LE/ENG 1101 4.00

Course credit exclusions:
LE/MECH 2100 1.00,
LE/MECH 2102 2.00.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

ENG 3000 3.00 Professional Engineering Practice

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1
- Fall
- Winter
- Summer

Year 2
- Fall
- Winter
- Summer

Year 3
- Fall
- Winter

Year 4
- Fall
- Winter

Engineering Projects: Management, Economics & Safety ENG 2001

OR

Engineering Projects: Management, Economics & Safety ENG 2001

Professional Engineering Practice ENG 3000

OR

Professional Engineering Practice ENG 3000

Engineering Project (Capstone) ENG 4000

Engineering Project (Capstone) ENG 4000

ENG 3000 3.00:
An introduction to the legal and ethical frameworks of the engineering profession, preparing students for the Professional Practice Examination required for certification as a professional engineer. Also covered are associated professional issues such as entrepreneurship, intellectual property and patents.

Prerequisites:
LE/ENG 2001 3.00

Corequisites:
LE/ENG 4000 6.00

Course credit exclusions:
LE/EECS 3000 3.00

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4402 4.00 Simulation Tools for Design & Analysis

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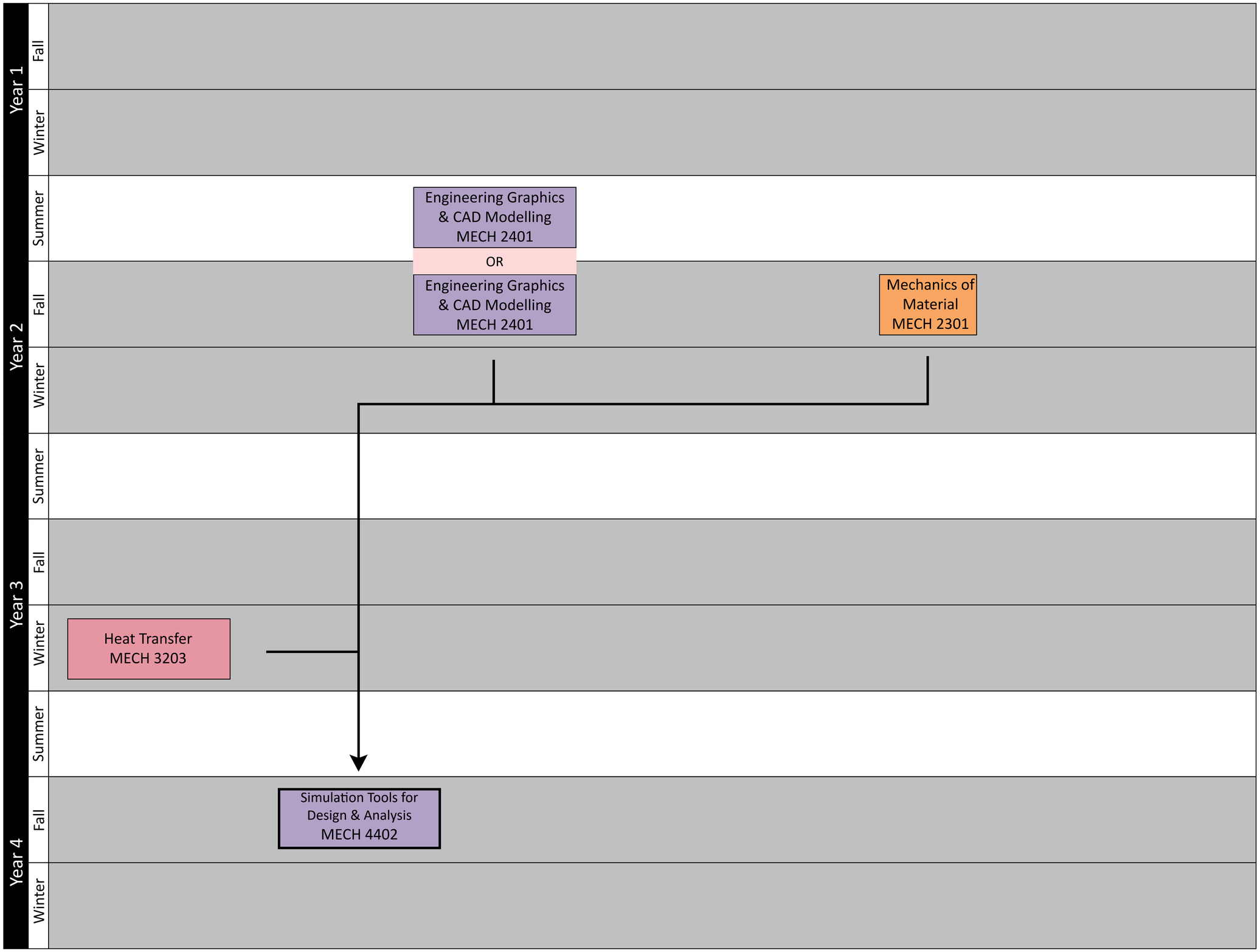

MECH 4402 4.00:
This course provides an introduction to numerical modeling (e.g. finite element analysis) and commercial software of choice. The application of commercial software to a selected number of problems (e.g. stress analysis, heat transfer, and/or fluid flow, etc. to design or analyze a system) is discussed. Result verification/interpretation of numerical modeling are emphasized.

Prerequisites:
LE/MECH 2301 3.00
or LE/ENG 3330 3.00,

LE/MECH 3203 3.00
or LE/ESSE 3360 3.00,

and LE/MECH 2401 3.00.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

ENG 4000 6.00 Engineering Project (Capstone)

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Year 1 – Fall
Year 1 – Winter
Year 1 – Summer
Year 2 – Fall
Year 2 – Winter
Year 2 – Summer
Year 3 – Fall
Year 3 – Winter
Year 3 – Summer
Year 4 – Fall
Year 4 – Winter

Professional Engineering Practice ENG 3000

OR

Professional Engineering Practice ENG 3000

Engineering Project (Capstone) ENG 4000

Engineering Project (Capstone) ENG 4000

ENG 4000 6.00:
The project will include significant elements of design and implementation. The format is intended to resemble engineering projects in practice, including specifications, background research, innovative solutions, analysis, testing and communication. 2 terms.

Prerequisites:
21 3000-level science or engineering credits in the Engineering Program, exclusive of LE/ENG 3000 3.00

Corequisites:
LE/ENG 3000 3.00

Course credit exclusions:
LE/CIVL 4000 6.00,
LE/ESSE 4000 6.00.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

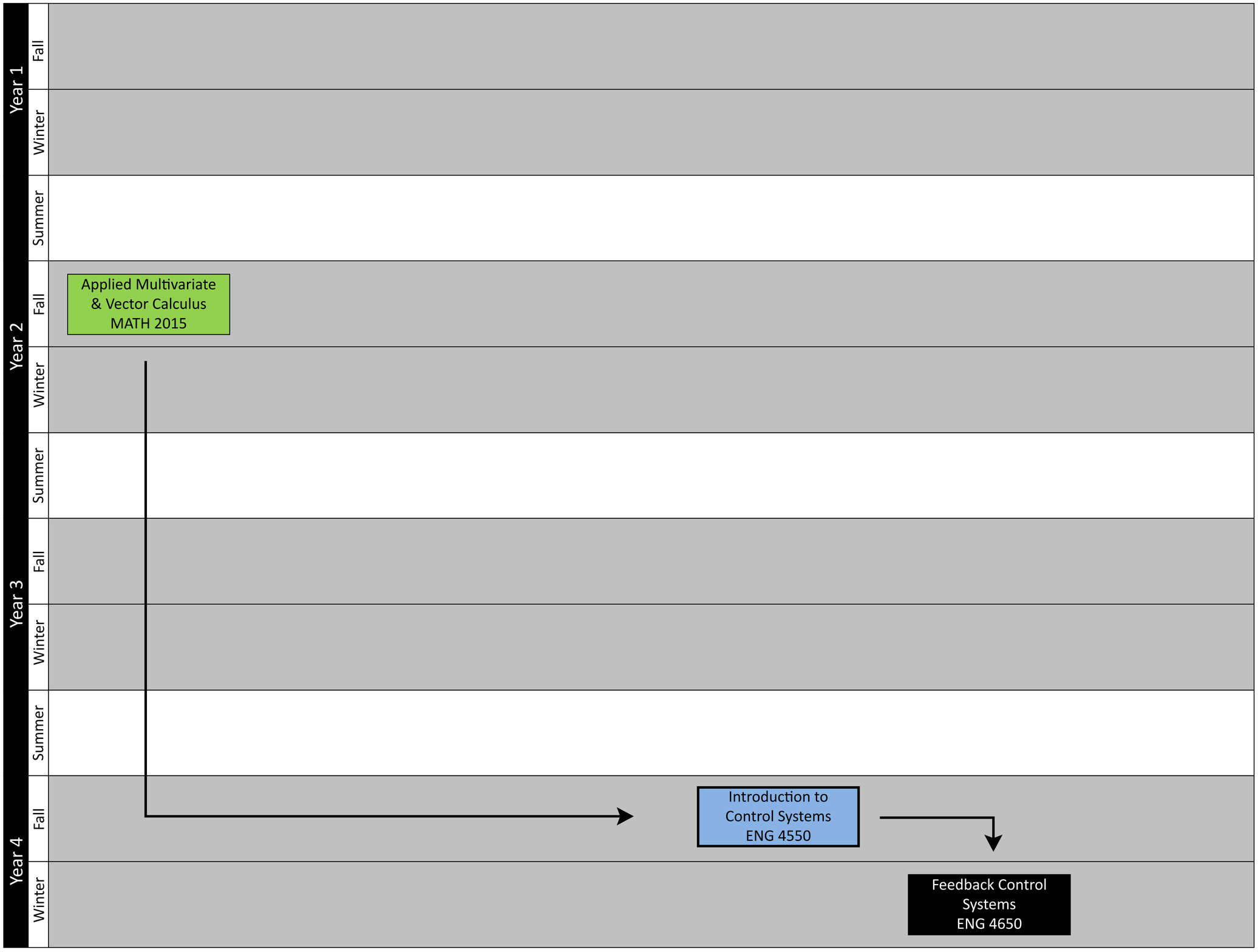
* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

ENG 4550 3.00 Introduction to Control Systems

"CLICK" item to go back to PROGRAM OVERVIEW



ENG 4550 3.00:
This course provides an introduction to classical control theory. From a base of dynamic system modeling the course will develop methods for modifying system behavior through feedback so as to produce desired performance and meet specifications in spite of disturbances and modeling errors. Students are expected to be versed in Linear Algebra, Ordinary Differential Equations, and Complex Variables. Signals and Systems would also be a definite asset.

Prerequisites:
SC/MATH 2015 3.00

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4502 3.00 Vibrations & Actuators

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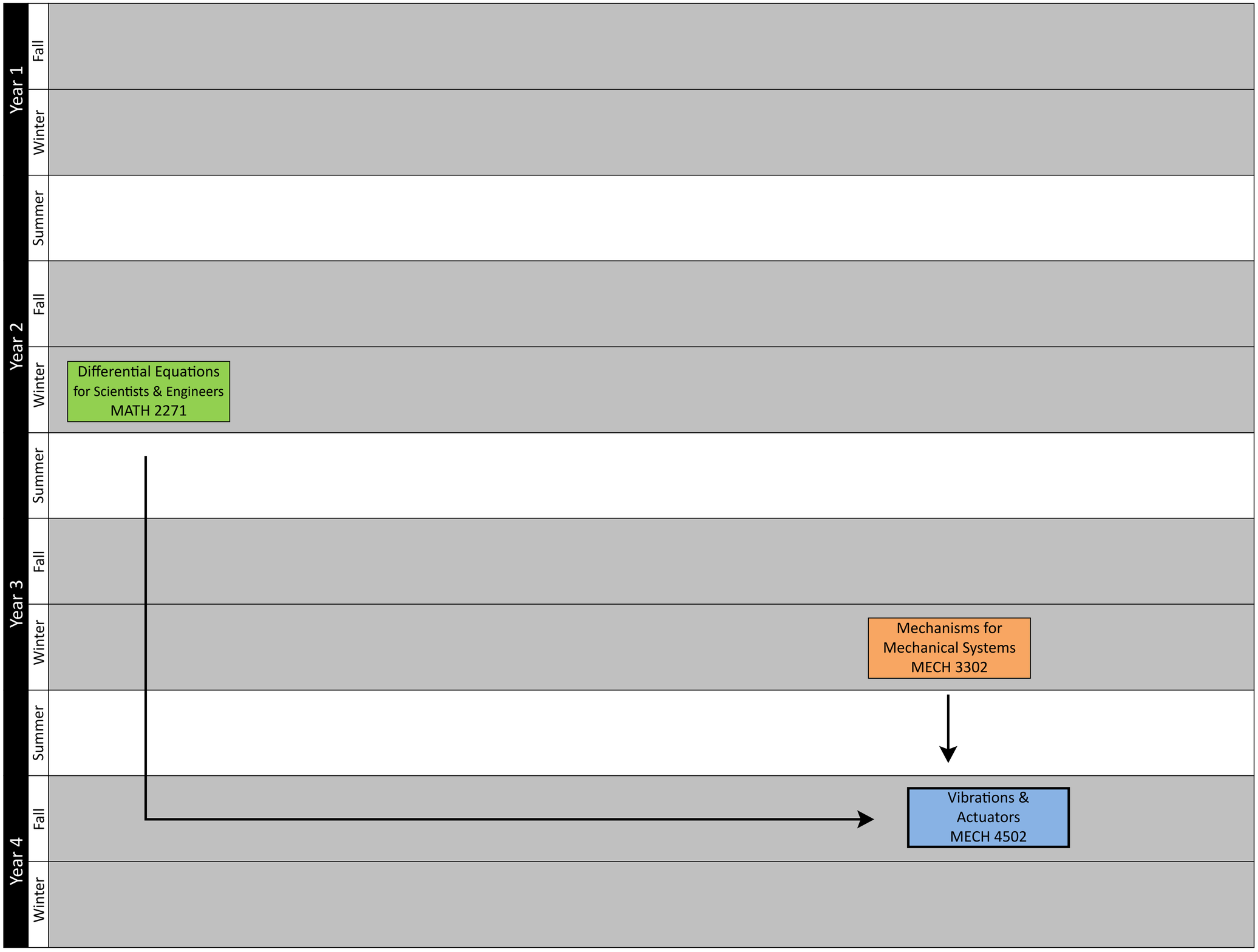


MECH 4502 3.00:
This course discusses free and forced vibration single degree of freedom systems with and without damping, steady state and transient vibrations, vibration of multi-degree of freedom systems, vibration isolation and modal analysis, beam vibrations, actuator characteristics, examples of actuators such as electrostatic, thermal, piezoelectric, or magnetic.

Prerequisites:
SC/MATH 2271 3.00,
and LE/MECH 3302 3.00.

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

Complementary Elective 3

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1	Fall	
	Winter	
	Summer	
Year 2	Fall	
	Winter	Complementary Elective 1
	Summer	
Year 3	Fall	Complementary Elective 2
	Winter	
	Summer	
Year 4	Fall	Complementary Elective 3
	Winter	Complementary Elective 4

Course Info:
A total of 12 credits of complementary studies courses must be taken, as identified thematic areas described in the Academic Calendar. At least 3 of the 12 credits must be taken in the humanities or social sciences, defined by the following areas: Anthropology, Humanities, English, History, Linguistics and Languages, Philosophy, Social Science, Modes of Reasoning and Women's Studies.

For more details go to calendars.registrar.yorku.ca and select the most current academic calendar year. On the left hand side under "ACADEMIC CALENDARS" select "programs by Faculty" and select "Lassonde School of Engineering."

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

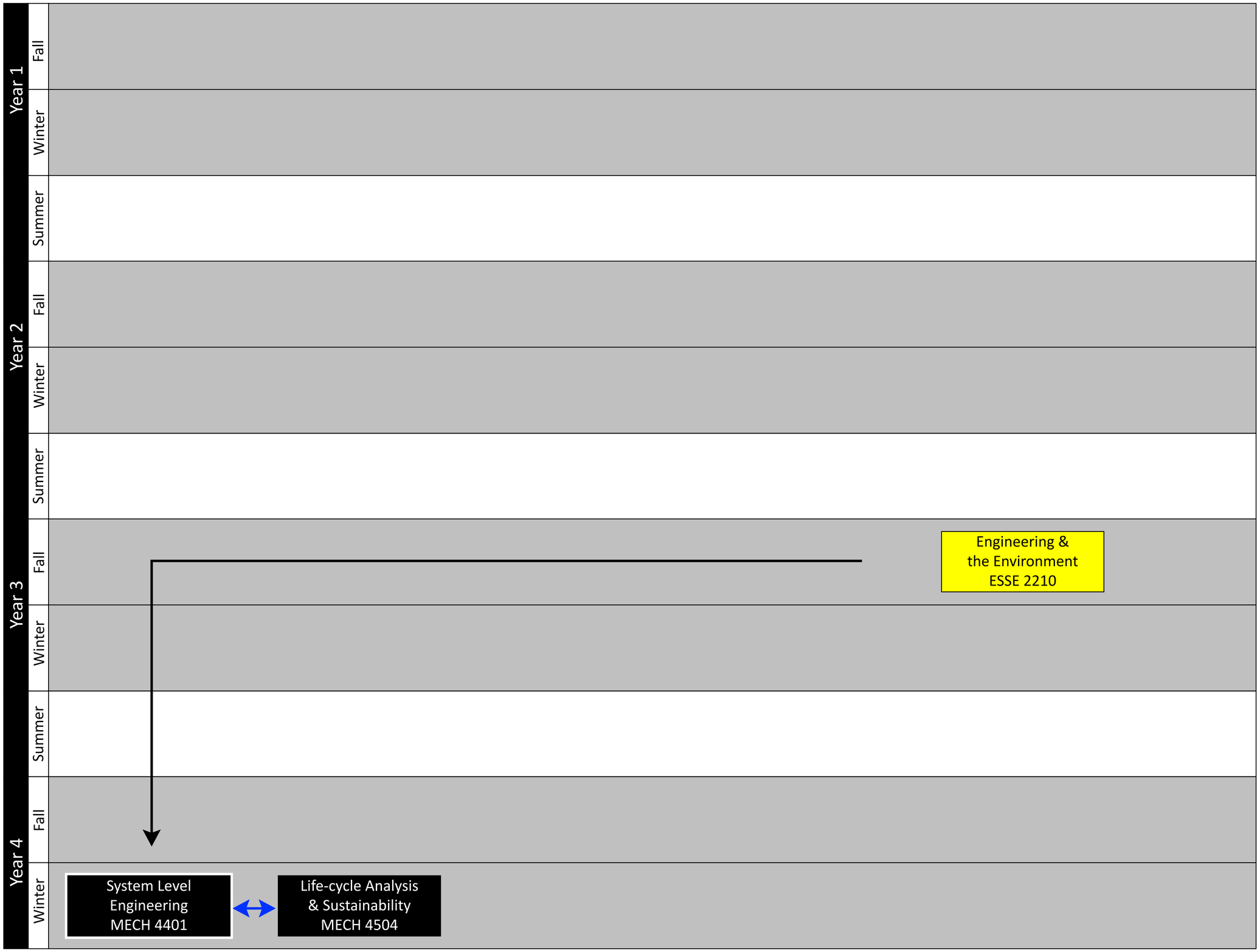
* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4401 3.00 System Level Engineering

"CLICK" item to go back to PROGRAM OVERVIEW



MECH 4401 3.00:
This course discusses system level analysis methodology for complex engineering cases (quantitative and qualitative methods/frameworks), technology selection, technology integration, and life cycle analysis.

Prerequisites:
ES/ENVS 2150 3.00,
or LE/ESSE 2210 3.00.

Corequisites:
LE/MECH 4504 3.00

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

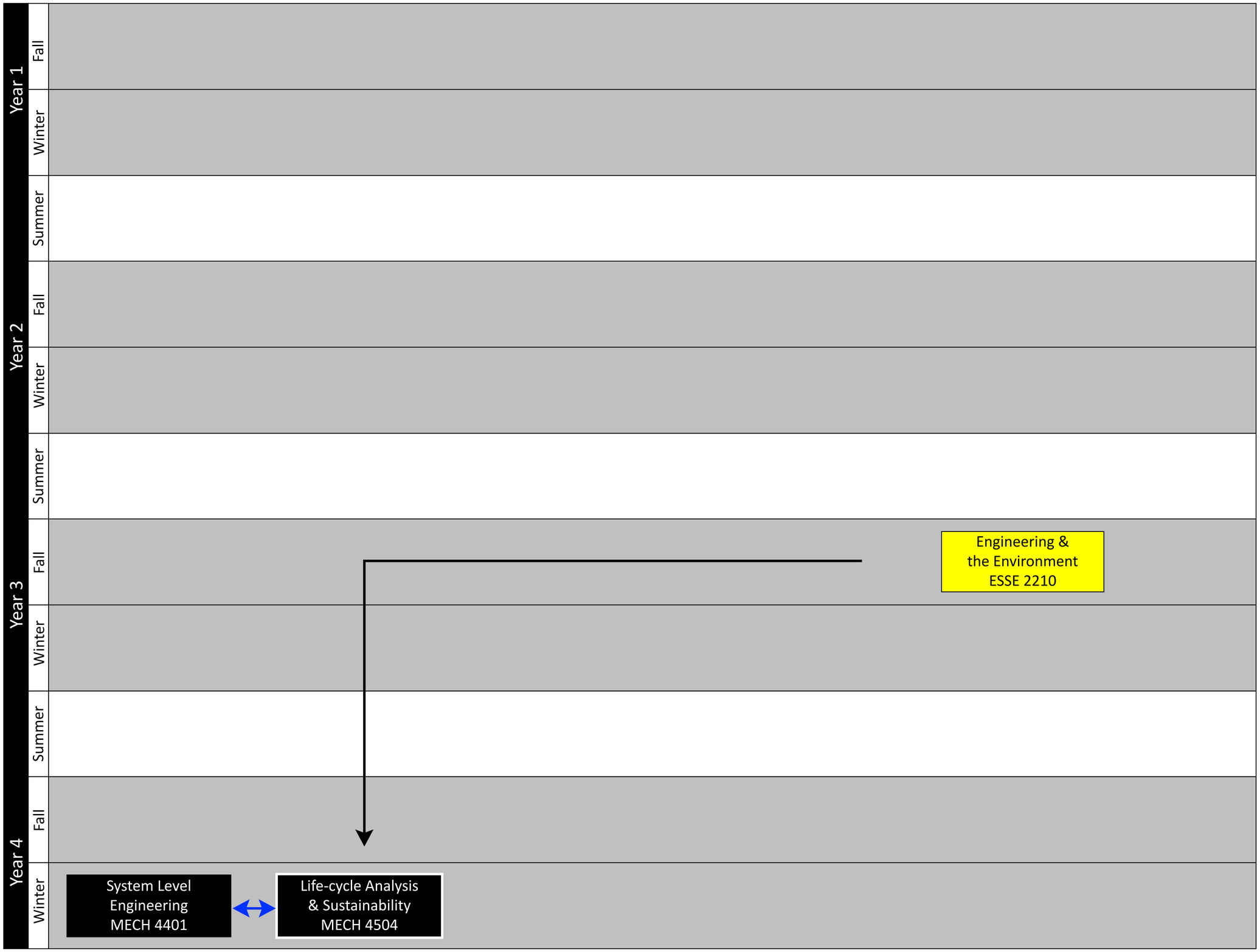
* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4504 3.00 Life-cycle Analysis and Sustainability

"CLICK" item to go back to PROGRAM OVERVIEW



MECH 4504 3.00:
This course discusses the notion of "triple bottom-line" or triple-E (energy, environment, economics), life Cycle inventory, computational structure of LC inventory, case studies and execution of a mini- LCA, as well as strengths, weaknesses and appropriate uses of LCA.

Prerequisites:
ES/ENVS 2150 3.00,
or LE/ESSE 2210 3.00.

Corequisites:
LE/MECH 4401 3.00

Course credit exclusions: None.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

ENG 4000 6.00 Engineering Project (Capstone)

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 – Fall
Year 1 – Winter
Year 1 – Summer
Year 2 – Fall
Year 2 – Winter
Year 2 – Summer
Year 3 – Fall
Year 3 – Winter
Year 3 – Summer
Year 4 – Fall
Year 4 – Winter

Professional Engineering Practice ENG 3000

OR

Professional Engineering Practice ENG 3000

Engineering Project (Capstone) ENG 4000

Engineering Project (Capstone) ENG 4000

ENG 4000 6.00:
The project will include significant elements of design and implementation. The format is intended to resemble engineering projects in practice, including specifications, background research, innovative solutions, analysis, testing and communication. 2 terms.

Prerequisites:
21 3000-level science or engineering credits in the Engineering Program, exclusive of LE/ENG 3000 3.00

Corequisites:
LE/ENG 3000 3.00

Course credit exclusions:
LE/CIVL 4000 6.00,
LE/ESSE 4000 6.00.

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

Technical Elective 1

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1	Fall				
	Winter				
	Summer				
Year 2	Fall				
	Winter				
	Summer				
Year 3	Fall				
	Winter				
	Summer				
Year 4	Fall				
	Winter			Technical Elective** 1	Technical Elective** 2

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**

MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

Technical Elective 2

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1	Fall	
	Winter	
	Summer	
Year 2	Fall	
	Winter	
	Summer	
Year 3	Fall	
	Winter	
	Summer	
Year 4	Fall	
	Winter	Technical Elective** 1
		Technical Elective** 2

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**

MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

Complementary Elective 4

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1	Fall		
	Winter		
	Summer		
Year 2	Fall		
	Winter	Complementary Elective 1	
	Summer		
Year 3	Fall	Complementary Elective 2	
	Winter		
	Summer		
Year 4	Fall	Complementary Elective 3	
	Winter	Complementary Elective 4	

Course Info:
A total of 12 credits of complementary studies courses must be taken, as identified thematic areas described in the Academic Calendar. At least 3 of the 12 credits must be taken in the humanities or social sciences, defined by the following areas: Anthropology, Humanities, English, History, Linguistics and Languages, Philosophy, Social Science, Modes of Reasoning and Women's Studies.

For more details go to calendars.registrar.yorku.ca and select the most current academic calendar year. On the left hand side under "ACADEMIC CALENDARS" select "programs by Faculty" and select "Lassonde School of Engineering."

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4510 3.00 Advanced Mechanical Technologies

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 — Fall | Winter | Summer

Year 2 — Fall: Applied Multivariate & Vector Calculus MATH 2015

Year 2 — Winter: Heat and Flow Engineering Principles MECH 2202

Year 2 — Summer

Year 3 — Fall: Electrical Systems for Mechanical Engineers EECS 3505

Year 3 — Winter

Year 3 — Summer

Year 4 — Fall

Year 4 — Winter: Advanced Mechanical Technologies MECH 4510; Technical Elective** 2

MECH 4510 3.00 Advanced Mechanical Technologies

Course Description
This course discusses non-traditional and interdisciplinary areas that mechanical engineers work for as well as analysis of assumptions, governing laws, behavior, and forces for a set of non-traditional systems (e.g. micro-fluidic systems, MEMS, electro-chemical-mechanical systems, biomedical devices, biological systems, etc.).

Prerequisites:
SC/MATH 2015 3.00
LE/MECH 2202 3.00
LE/EECS 3505 3.00

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

Mathematics Courses
Thermofluid Courses
Mechatronics Courses
Solid Mechanics Courses
Design Courses
Soft Skills Courses
Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4510 3.00 Advanced Mechanical Technologies

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 — Fall | Winter | Summer

Year 2 — Fall: Applied Multivariate & Vector Calculus MATH 2015

Year 2 — Winter: Heat and Flow Engineering Principles MECH 2202

Year 2 — Summer

Year 3 — Fall: Electrical Systems for Mechanical Engineers EECS 3505

Year 3 — Winter

Year 3 — Summer

Year 4 — Fall

Year 4 — Winter: Technical Elective** 1; Advanced Mechanical Technologies MECH 4510

MECH 4510 3.00 Advanced Mechanical Technologies

Course Description
This course discusses non-traditional and interdisciplinary areas that mechanical engineers work for as well as analysis of assumptions, governing laws, behavior, and forces for a set of non-traditional systems (e.g. micro-fluidic systems, MEMS, electro-chemical-mechanical systems, biomedical devices, biological systems, etc.).

Prerequisites:
SC/MATH 2015 3.00
LE/MECH 2202 3.00
LE/EECS 3505 3.00

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4511 3.00 Energy and Power Production Systems (International Experience)

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 — Fall | Winter | Summer

Year 2 — Fall | Winter | Summer

Year 3 — Fall

Fluid Dynamics MECH 3202

Electrical Systems for Mechanical Engineers EECS 3505

Year 3 — Winter

Macro-and-Micro Manufacturing Methods MECH 3503

Year 3 — Summer | Year 4 — Fall

Year 4 — Winter

Energy and Power Production Systems MECH 4511

Technical Elective** 2

MECH 4511 3.00 Energy and Power Production Systems (International Experience)

Course Description
In an international setting, this course discusses traditional and non-traditional as well as interdisciplinary areas that mechanical engineers work in; the course provides opportunities for immersion in an international culture of learning and working. It involves analysis of assumptions, governing laws, behavior, forces, and energy for various systems (e.g. design of turbomachinery/gas turbine). This course consists of pre-travel workshops and lectures as well as lectures and labs on the campus of an international partner institution.

Prerequisites:
LE/MECH 3202 3.00
LE/MECH 3503 3.00
LE/EECS 3505 3.00
Permission by course instructor through a formal application.

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

Mathematics Courses
Thermofluid Courses
Mechatronics Courses
Solid Mechanics Courses
Design Courses
Soft Skills Courses
Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4511 3.00 Energy and Power Production Systems (International Experience)

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 — Fall
Year 1 — Winter
Year 1 — Summer
Year 2 — Fall
Year 2 — Winter
Year 2 — Summer
Year 3 — Fall
Fluid Dynamics MECH 3202
Electrical Systems for Mechanical Engineers EECS 3505
Year 3 — Winter
Macro-and-Micro Manufacturing Methods MECH 3503
Year 3 — Summer
Year 4 — Fall
Year 4 — Winter
Technical Elective** 1
Energy and Power Production Systems MECH 4511

MECH 4511 3.00 Energy and Power Production Systems (International Experience)

Course Description
In an international setting, this course discusses traditional and non-traditional as well as interdisciplinary areas that mechanical engineers work in; the course provides opportunities for immersion in an international culture of learning and working. It involves analysis of assumptions, governing laws, behavior, forces, and energy for various systems (e.g. design of turbomachinery/gas turbine). This course consists of pre-travel workshops and lectures as well as lectures and labs on the campus of an international partner institution.

Prerequisites:
LE/MECH 3202 3.00
LE/MECH 3503 3.00
LE/EECS 3505 3.00
Permission by course instructor through a formal application.

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4512 3.00 Principles of Bioengineering

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 – Fall
Year 1 – Winter
Year 1 – Summer
Year 2 – Fall
Year 2 – Winter
Year 2 – Summer
Year 3 – Fall
Year 3 – Winter
Year 3 – Summer
Year 4 – Fall
Year 4 – Winter

Macro-and-Micro Manufacturing Methods MECH 3503

Principles of Bioengineering MECH 4512

Technical Elective** 2

MECH 4512 3.00 Principles of Bioengineering

Course Description
Introduction to contemporary themes in bioengineering including: biological concepts for engineers; cell and tissue engineering; regenerative medicine and stem cells, bionanotechnology, biomaterials, drug screening, bioreactors, biotechnology, bioinformatics, genetic engineering, clinical trials and regulations.

Prerequisites:
21 3000-level science or engineering credits including MECH 3503 3.00

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4512 3.00 Principles of Bioengineering

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 / Fall
Year 1 / Winter
Year 1 / Summer
Year 2 / Fall
Year 2 / Winter
Year 2 / Summer
Year 3 / Fall
Year 3 / Winter
Year 3 / Summer
Year 4 / Fall
Year 4 / Winter

Macro-and-Micro Manufacturing Methods MECH 3503

Technical Elective** 1

Principles of Bioengineering MECH 4512

MECH 4512 3.00 Principles of Bioengineering

Course Description
Introduction to contemporary themes in bioengineering including: biological concepts for engineers; cell and tissue engineering; regenerative medicine and stem cells, bionanotechnology, biomaterials, drug screening, bioreactors, biotechnology, bioinformatics, genetic engineering, clinical trials and regulations.

Prerequisites:
21 3000-level science or engineering credits including MECH 3503 3.00

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4201 3.00 Transport Phenomena

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 – Fall
Year 1 – Winter
Year 1 – Summer
Year 2 – Fall
Year 2 – Winter
Year 2 – Summer
Year 3 – Fall: Engineering Thermodynamics MECH 3201
Year 3 – Winter: Heat Transfer MECH 3203
Year 3 – Summer
Year 4 – Fall
Year 4 – Winter: Transport Phenomena MECH 4201; Technical Elective** 2

MECH 4201 3.00 Transport Phenomena

Course Description
Introduction to constitutive equations and basic principles for mass transport, momentum transport and/or energy transport at two different scales of macroscopic and microscopic; examples from novel and traditional mechanical systems and applications are discussed.

Prerequisites:
LE/MECH 3201 3.00
LE/MECH 3203 3.00

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4201 3.00 Transport Phenomena

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 — Fall
Year 1 — Winter
Year 1 — Summer
Year 2 — Fall
Year 2 — Winter
Year 2 — Summer
Year 3 — Fall: Engineering Thermodynamics MECH 3201
Year 3 — Winter: Heat Transfer MECH 3203
Year 3 — Summer
Year 4 — Fall
Year 4 — Winter: Technical Elective** 1; Transport Phenomena MECH 4201

MECH 4201 3.00 Transport Phenomena

Course Description
Introduction to constitutive equations and basic principles for mass transport, momentum transport and/or energy transport at two different scales of macroscopic and microscopic; examples from novel and traditional mechanical systems and applications are discussed.

Prerequisites:
LE/MECH 3201 3.00
LE/MECH 3203 3.00

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4202 3.00 Aerodynamics

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 — Fall
Year 1 — Winter
Year 1 — Summer
Year 2 — Fall
Year 2 — Winter
Year 2 — Summer
Year 3 — Fall: Engineering Thermodynamics MECH 3201; Fluid Dynamics MECH 3202
Year 3 — Winter
Year 3 — Summer
Year 4 — Fall
Year 4 — Winter: Aerodynamics MECH 4202; Technical Elective** 2

MECH 4202 3.00 Aerodynamics

Course Description
This course is a first course specialized in aerodynamics. In this course the flow over aerofoils, wings, and bluff bodies are studied. Potential flow is used to develop the theory of flow over aerofoils and wings, using classical and numerical methods, such as thin-aerofoil theory, vortex panel methods, and lifting-line theory. Additional topics include compressible flows, supersonic aerofoils and aircraft performance.

Prerequisites:
LE/MECH 3201 3.00
LE/MECH 3202 3.00

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

Mathematics Courses
Thermofluid Courses
Mechatronics Courses
Solid Mechanics Courses
Design Courses
Soft Skills Courses
Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4202 3.00 Aerodynamics

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 — Fall | Winter | Summer

Year 2 — Fall | Winter | Summer

Year 3 — Fall | Winter | Summer

Year 4 — Fall | Winter

Engineering Thermodynamics MECH 3201

Fluid Dynamics MECH 3202

Technical Elective** 1

Aerodynamics MECH 4202

MECH 4202 3.00 Aerodynamics

Course Description
This course is a first course specialized in aerodynamics. In this course the flow over aerofoils, wings, and bluff bodies are studied. Potential flow is used to develop the theory of flow over aerofoils and wings, using classical and numerical methods, such as thin-aerofoil theory, vortex panel methods, and lifting-line theory. Additional topics include compressible flows, supersonic aerofoils and aircraft performance.

Prerequisites:
LE/MECH 3201 3.00
LE/MECH 3202 3.00

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4203 3.00 Energy Conversion and Storage

"CLICK" item to go back to PROGRAM OVERVIEW

	Fall	Winter	Summer
Year 1			
Year 2			
Year 3	Engineering Thermodynamics MECH 3201	Heat Transfer MECH 3203	
Year 4	Energy Conversion and Storage MECH 4203	Technical Elective** 2	

MECH 4203 3.00 Energy Conversion and Storage

Course Description
This course gives a comprehensive view of energy conversion processes and technologies in the context of the global energy system. A cohesive thermodynamic framework is developed to evaluate any energy conversion process or technology. The framework is used to understand how energy is transformed from a primary energy source to its ultimate end use. The concepts of primary energy, secondary energy, energy-use sectors (industrial, transportation, residential, commercial, and electric power sectors), energy transmission, and energy storage are illustrated. Electricity generation technologies, including fossil fuels, nuclear, solar, wind, and hydroelectricity, are analyzed and compared in terms of efficiency, cost, and environmental impact. End uses other than electricity, including space heating, industrial process heat, and transportation are emphasized. The requirements for transitioning the Canadian and global energy systems to a sustainable system based on renewable and carbon-neutral technologies are discussed.

Prerequisites:
LE/MECH 3201 3.00
LE/MECH 3203 3.00

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4203 3.00 Energy Conversion and Storage

"CLICK" item to go back to PROGRAM OVERVIEW

	Fall	Winter	Summer
Year 1			
Year 2			
Year 3	Engineering Thermodynamics MECH 3201	Heat Transfer MECH 3203	
Year 4	Technical Elective** 1	Energy Conversion and Storage MECH 4203	

MECH 4203 3.00 Energy Conversion and Storage

Course Description

This course gives a comprehensive view of energy conversion processes and technologies in the context of the global energy system. A cohesive thermodynamic framework is developed to evaluate any energy conversion process or technology. The framework is used to understand how energy is transformed from a primary energy source to its ultimate end use. The concepts of primary energy, secondary energy, energy-use sectors (industrial, transportation, residential, commercial, and electric power sectors), energy transmission, and energy storage are illustrated. Electricity generation technologies, including fossil fuels, nuclear, solar, wind, and hydroelectricity, are analyzed and compared in terms of efficiency, cost, and environmental impact. End uses other than electricity, including space heating, industrial process heat, and transportation are emphasized. The requirements for transitioning the Canadian and global energy systems to a sustainable system based on renewable and carbon-neutral technologies are discussed.

Prerequisites:

LE/MECH 3201 3.00
LE/MECH 3203 3.00

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

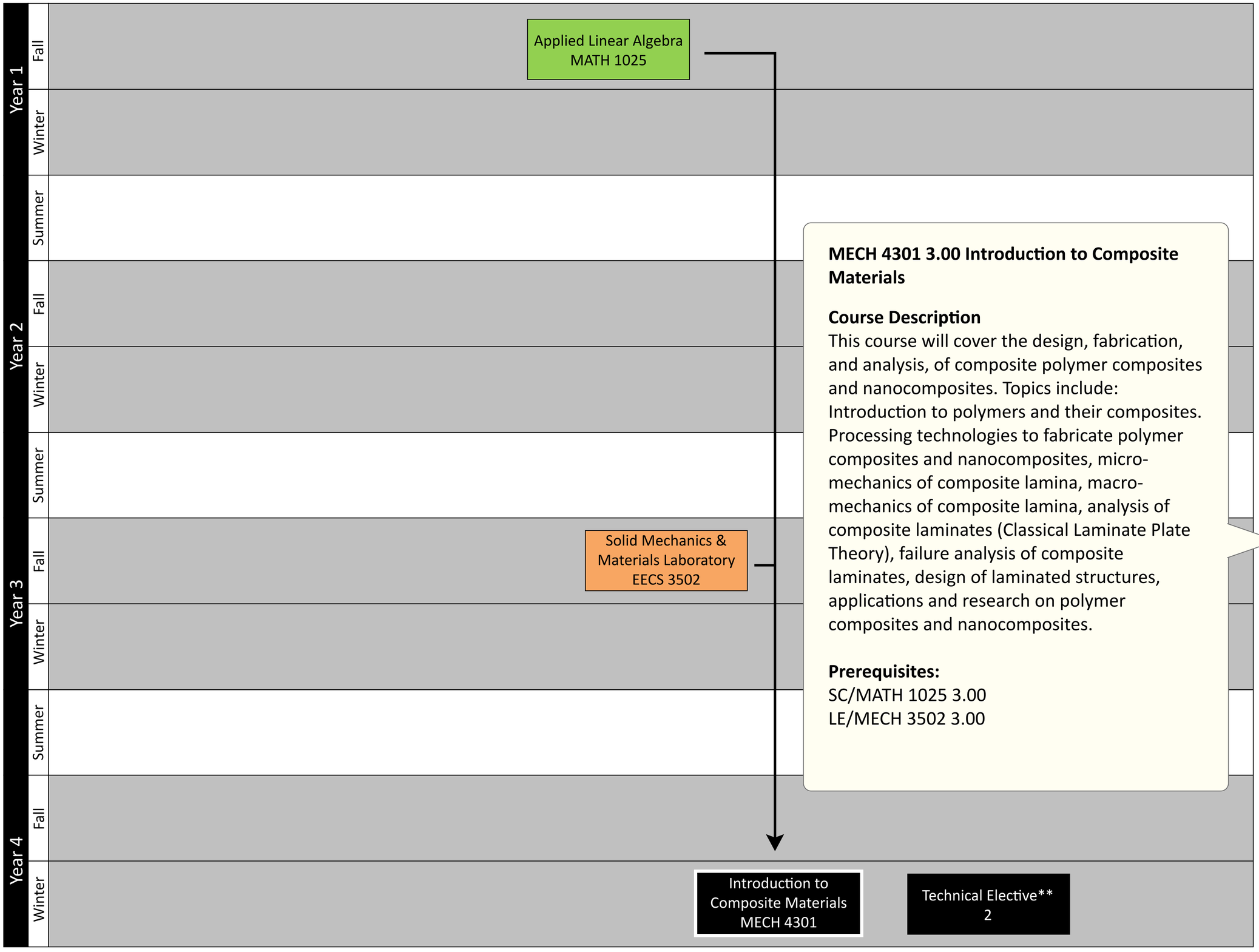
* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**

MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4301 3.00 Introduction to Composite Materials

"CLICK" item to go back to PROGRAM OVERVIEW



MECH 4301 3.00 Introduction to Composite Materials

Course Description
This course will cover the design, fabrication, and analysis, of composite polymer composites and nanocomposites. Topics include: Introduction to polymers and their composites. Processing technologies to fabricate polymer composites and nanocomposites, micro-mechanics of composite lamina, macro-mechanics of composite lamina, analysis of composite laminates (Classical Laminate Plate Theory), failure analysis of composite laminates, design of laminated structures, applications and research on polymer composites and nanocomposites.

Prerequisites:
SC/MATH 1025 3.00
LE/MECH 3502 3.00

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

MECH 4301 3.00 Introduction to Composite Materials

"CLICK" item to go back to PROGRAM OVERVIEW

Year 1 — Fall
- Applied Linear Algebra MATH 1025

Year 1 — Winter

Year 1 — Summer

Year 2 — Fall

Year 2 — Winter

Year 2 — Summer

Year 3 — Fall
- Solid Mechanics & Materials Laboratory EECS 3502

Year 3 — Winter

Year 3 — Summer

Year 4 — Fall

Year 4 — Winter
- Technical Elective** 1
- Introduction to Composite Materials MECH 4301

MECH 4301 3.00 Introduction to Composite Materials

Course Description
This course will cover the design, fabrication, and analysis, of composite polymer composites and nanocomposites. Topics include: Introduction to polymers and their composites. Processing technologies to fabricate polymer composites and nanocomposites, micro-mechanics of composite lamina, macro-mechanics of composite lamina, analysis of composite laminates (Classical Laminate Plate Theory), failure analysis of composite laminates, design of laminated structures, applications and research on polymer composites and nanocomposites.

Prerequisites:
SC/MATH 1025 3.00
LE/MECH 3502 3.00

**** Technical electives**
- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

**** Technical electives**
MECH 4510: Advanced Mechanical Technologies
MECH 4511: Energy and Power Production Systems (Intl. Experience)
MECH 4512: Principles of Bioengineering
MECH 4201: Transport Phenomena
MECH 4202: Aerodynamics
MECH 4203: Energy Conversion and Storage
MECH 4301: Introduction to Composite Materials
ENG 4650: Feedback Control Systems

ENG 4650 3.00 Feedback Control Systems

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Year 1 — Fall
Year 1 — Winter
Year 1 — Summer
Year 2 — Fall
Year 2 — Winter
Year 2 — Summer
Year 3 — Fall
Year 3 — Winter
Year 3 — Summer
Year 4 — Fall
Year 4 — Winter

ENG 4650 3.00 Feedback Control Systems

Course Description
This course teaches fundamentals of control design and analysis using state-space methods. This includes both the practical and theoretical aspects of the topic. The students are expected to design controllers using state-space methods and evaluate the control performance and validate if these controllers are robust to system uncertainties and external disturbances.

Prerequisites:
LE/ENG 4550 3.00

or the following combination of courses:
SC/MATH 3410 3.00; SC/MATH 2270 3.00
or
SC/MATH 2271 3.00; SC/MATH 2022 3.00

Introduction to Control Systems ENG 4550

Feedback Control Systems ENG 4650

Technical Elective** 2

**** Technical electives**

- Advanced Mechanical Technologies MECH 4510
- Energy and Power Production Systems (International Experience) MECH 4511
- Principles of Bioengineering MECH 4512
- Transport Phenomena MECH 4201
- Aerodynamics MECH 4202
- Energy Conversion and Storage MECH 4203
- Introduction to Composite Materials MECH 4301
- Feedback Control Systems ENG 4650

- Mathematics Courses
- Thermofluid Courses
- Mechatronics Courses
- Solid Mechanics Courses
- Design Courses
- Soft Skills Courses
- Advanced Mechanics Courses

* Co-op Option (Optional)

* Co-op Option is available; students need to fulfill the requirements for the Co-Op option specified by the Lassonde School of Engineering

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Introduction to Control Systems ENG 4550 → Feedback Control Systems ENG 4650

Technical Elective** 1

Feedback Control Systems ENG 4650

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