Process Engineering in Memorial University of Newfoundland

The full-time 141 credit hour Bachelor of Engineering (Co-operative), Process Engineering Major, requires eight academic terms and four work terms.

The 141 credit hours shall normally be taken in the academic terms and order as set out in [Process Engineering Major](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/#d.en.328557).

Beginning in Academic Term 6, a student will follow the [Chemical and Bioprocess](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/#d.en.328558) Stream or the [Mineral and Energy Resources](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/#d.en.328559) Stream with elective course options as outlined in [Process Engineering Major](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/#d.en.328557).

Work terms shall normally be taken in the order as set out in [Process Engineering Major](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/#d.en.328557).

Process Engineering students may complete a minor in Chemistry as outlined under [Faculty of Science, Chemistry, Minor in Chemistry](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-science/11/3/#d.en.304041).

Certainly! Here's the formatted table for Process Engineering based on the structure you provided:

\*\*Engineering One Term:\*\*

- \*\*Required Courses:\*\*

1. Chemistry 1050 or 1200

2. ENGI 1010, 1020, 1030, 1040

3. 3 credit hours in English at the 1000 level or any Critical Reading and Writing course

4. Mathematics 1000, 1001, 2050

5. Physics 1050, 1051

- Elective Courses:

- Students who are expecting to successfully complete the Engineering One requirements by the end of the Winter semester may apply to undertake a work term during the Spring semester. In this case, the prerequisite course ENGI 200W is expected to be successfully completed during the Fall semester. All other students are expected to successfully complete ENGI 200W in the Winter semester of Engineering One.

- In addition to meeting the requirements outlined below, a student must successfully complete four Complementary Studies courses as described under Description of Program, Complementary Studies.

\*\*Fall - Academic Term 3:\*\*

- \*\*Required Courses:\*\*

1. Chemistry 1051, 2400

2. ENGI 3101, 3424

3. ME 3401

4. PROC 3000

\*\*Winter:\*\*

- \*\*Required Courses:\*\*

1. ENGI 001W or 002W

\*\*Spring - Academic Term 4:\*\*

- \*\*Required Courses:\*\*

1. ENGI 4430

2. PROC 4002, 4021, 4025, 4061

\*\*Fall:\*\*

- \*\*Required Courses:\*\*

1. ENGI 001W OR 002W OR 003W

\*\*Winter - Academic Term 5:\*\*

- \*\*Required Courses:\*\*

1. ENGI 4421

2. PROC 5001, 5002, 5071, 5092

\*\*Spring:\*\*

- \*\*Required Courses:\*\*

1. ENGI 002W or 003W or 004W

\*\*Fall - Academic Term 6:\*\*

- \*\*Required Courses:\*\*

1. PROC 6025, 6031, 6061, 6071

- Elective Courses:

- 3 credit hours from Technical Streams courses, Academic Term 6

\*\*Winter:\*\*

- \*\*Required Courses:\*\*

1. ENGI 003W or 004W or 005W (optional)

\*\*Spring - Academic Term 7:\*\*

- \*\*Required Courses:\*\*

1. PROC 7021, 7040, 7077

- Elective Courses:

- 6 credit hours from Technical Streams courses, Academic Term 7

\*\*Fall:\*\*

- \*\*Required Courses:\*\*

1. ENGI 004W or 005W (optional) or 006W (optional)

\*\*Winter - Academic Term 8:\*\*

- \*\*Required Courses:\*\*

1. ENGI 8152

2. PROC 8040

- Elective Courses:

- One free elective which must be a 2000-level or higher course from any academic unit. Selection of a course must be approved by the Head of the Department of Process Engineering.

- 9 credit hours from Technical Streams courses, Academic Term 8

- Technical Streams are available in the areas of [Chemical and Bioprocess](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/#d.en.328558), and [Mineral and Energy Resources](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/#d.en.328559).

- A student may experience scheduling difficulties if courses are selected from more than one Technical Stream.

- The selection of a course as a technical stream course from outside these lists requires the approval of the Head of the Department of Process Engineering.

- Technical Streams:

\*\*Chemical and Bioprocess:\*\*

\*\*Academic Term 6:\*\*

- \*\*Required Courses:\*\*

1. PROC 6151

\*\*Academic Term 7:\*\*

- Between Term 7 and Term 8, a student must choose four courses from the Elective Courses:

- Elective Courses:

1. PROC 7125

2. PROC 7131

3. PROC 7141

4. PROC 7171

\*\*Academic Term 8:\*\*

- \*\*Required Courses:\*\*

1. PROC 8125

- Between Term 7 and Term 8, a student must choose four courses from the Elective Courses:

- Elective Courses:

1. ECE 8210

2. PROC 8141

3. PROC 8151

4. PROC 8170

\*\*Mineral and Energy Resources:\*\*

\*\*Academic Term 6:\*\*

- \*\*Required Courses:\*\*

1. PROC 6202

\*\*Academic Term 7:\*\*

- \*\*Required Courses:\*\*

1. PROC 7291

2. PROC 7293

\*\*Academic Term 8:\*\*

- \*\*A student must choose three courses from the Elective Courses:\*\*

- Elective Courses:

1. PROC 8125

2. PROC 8276

3. PROC 8291

4. PROC 8292

5. PROC 8293

For Chemistry Majors or Honours students, a Minor in Applied Science - Process Engineering will consist of

1. Chemistry [1051](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/);
2. PROC [3000](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) (or the former ENGI 3600)
3. PROC [4021](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) (or the former ENGI 4621)
4. PROC [4002](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) (or the former ENGI 4602 or Chemistry [2301](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/))
5. PROC [4025](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) (or the former ENGI 4625)
6. PROC [4061](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) (or ME [4501](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) or the former ENGI 4661 or the former ENGI 4961) and
7. 6 credit hours chosen from:  
   1. PROC [5001](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) (or the former ENGI 5601)
   2. PROC [6025](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) (or the former ENGI 6621 or the former PROC 6021)
   3. PROC [6031](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) (or the former ENGI 6631)
   4. PROC [6151](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) (or the former ENGI 6651)
   5. PROC [7021](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) (or the former ENGI 7621)
   6. PROC [7171](https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/6/7/) (or the former ENGI 8671).

Completion of the Minor in Applied Science - Process Engineering does not qualify persons to hold the designation "Professional Engineer" as defined by various provincial acts governing the Engineering Profession.

Process Engineering courses are identified by a four-digit numbering system, the first two digits signifying the following:

The first digit denotes the academic term during which the course is normally offered.

The second digit denotes the primary areas of study, namely:

| 0: Process Engineering courses common to both technical streams |
| --- |
| 1: Chemical and Bioprocess Stream |
| 2: Mineral and Energy Resources Stream |
| 9: Special Topics |

Non-departmental Engineering courses are designated by ENGI.

Process Engineering courses are designated by PROC.

\*\*Course Title:\*\* PROC 3000 Introduction to Sustainable Process Engineering

\*\*Course Information:\*\* PROC 3000 familiarizes students with the principles and practical aspects of organic, inorganic, and biochemical processes, including major unit operations and equipment. It emphasizes process flow sheeting, process variable identification, component and overall material balances, and process design. The course uses extensive examples from industrial processes. In laboratory sessions, students are introduced to laboratory-scale process equipment and use HYSYS software to study process characteristics.

\*\*CO:\*\* Chemistry 1051

\*\*EQ:\*\* The former ENGI 3600

\*\*LH:\*\* At least five 2-hour sessions per semester

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303718>

\*\*Course Title:\*\* PROC 4002 Process Engineering Thermodynamics

\*\*Course Information:\*\* PROC 4002 extends the study started in ME 3401 of thermodynamics, with special reference to chemical process applications. It covers basic laws, thermodynamic properties of pure fluids and mixtures, heat engines, multicomponent systems, thermal/mechanical equilibrium, chemical equilibrium, and thermodynamics of chemical processes. Special emphasis is placed on the application of thermodynamics to practical problems in chemical engineering such as phase equilibria, solutions, and reaction equilibria in separations and reaction engineering.

\*\*CR:\*\* The former Chemistry 2300, the former Chemistry 3300

\*\*EQ:\*\* The former ENGI 4602

\*\*PR:\*\* ME 3401 or the former ENGI 3901

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303702>

\*\*Course Title:\*\* PROC 4021 Process Mathematical Methods

\*\*Course Information:\*\* PROC 4021 introduces numerical methods in chemical engineering processes, covering the solution of sets of linear algebraic equations, solution of non-linear equations, curve fitting and interpolation, numerical integration, numerical differentiation, first order and higher-order ordinary differential equations, boundary value problems, and partial differential equations. It provides applications of the methods to different aspects of process engineering such as reactor design, separation, process modeling, equipment design, and analysis.

\*\*CO:\*\* PROC 4025 or the former ENGI 4625

\*\*EQ:\*\* The former ENGI 4621

\*\*LH:\*\* Eight 2.5-hour sessions per semester

\*\*PR:\*\* ENGI 3424 (or Mathematics 2000, Mathematics 2050, and Mathematics 2260)

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303728>

\*\*Course Title:\*\* PROC 4025 Process Engineering Calculations

\*\*Course Information:\*\* PROC 4025 is an introduction to the analysis of chemical processes with an emphasis on mass and energy balances. Stoichiometric relationships, ideal and real gas behavior are also covered. The course helps Process Engineering majors develop a framework for the analysis of flow sheet problems and presents systematic approaches for manual and computer-aided solutions of full-scale balance problems.

\*\*CO:\*\* PROC 4002 or the former ENGI 4602. There is no co-requisite for students completing a minor in Applied Science - Process Engineering.

\*\*EQ:\*\* The former ENGI 4625

\*\*PR:\*\* ME 3401 or the former ENGI 3901. Students completing a minor in Applied Science - Process Engineering must successfully complete Chemistry 2301 as the prerequisite instead of ME 3401.

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303721>

\*\*Course Title:\*\* PROC 4061 Process Fluid Dynamics I

\*\*Course Information:\*\* PROC 4061 provides process engineering students with fundamentals of fluid mechanics/dynamics. Topics covered include fluid properties; Newtonian and non-Newtonian fluids; pressure; hydrostatics; control volume and system representation; mass and momentum conservation laws; Euler and Bernoulli equations; viscous fluid flows; laminar and turbulent flow; flow through conduits and pipes; pipe networks; flow measurement devices; momentum devices; concept of boundary layers; dimensional analysis; lift and drag on objects; fluid transportation (pumps and compressors).

\*\*CR:\*\* The former ENGI 4913, the former ENGI 4961, the former ENGI 5961

\*\*EQ:\*\* The former ENGI 4661

\*\*LH:\*\* Five 1-hour sessions per semester

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303723>

\*\*Course Title:\*\* PROC 5001 Mass Transfer

\*\*Course Information:\*\* PROC 5001 covers diffusive as well as convective mass transfer, mass transfer correlations, and the application to absorption and membrane separations.

\*\*EQ:\*\* The former ENGI 5601

\*\*LH:\*\* At least seven 2-hour sessions per semester

\*\*PR:\*\* PROC 4002 or the former ENGI 4602 (or Chemistry 2301)

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303697>

\*\*Course Title:\*\* PROC 5002 Process Heat Transfer

\*\*Course Information:\*\* PROC 5002 is a study of concepts involved in heat transfer. Topics include applications of continuity and energy equations, fundamentals of heat transfer, modes of heat transfer, conduction, convection, and radiation heat transfer, boiling and condensation, evaporation, and heat exchanger analysis and design.

\*\*CR:\*\* The former ENGI 6901

\*\*EQ:\*\* The former ENGI 5602

\*\*LH:\*\* One 3-hour session per semester

\*\*PR:\*\* PROC 4002 or the former ENGI 4602, PROC 4061 or the former ENGI 4661 or ME 4501 or the former ENGI 4961 or the former ENGI 5961

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303711>

\*\*Course Title:\*\* PROC 5071 Process Equipment Design I

\*\*Course Information:\*\* PROC 5071 introduces the principles of unit operations, grouped into four sections: fluid mechanics, heat transfer, mass transfer and equilibrium stages, and operations involving particulate solids. It also includes design and operation fundamentals of unit operations: size reduction, filtration, evaporation, drying, crystallization, and humidification, and membrane separation.

\*\*CO:\*\* PROC 5001 or the former ENGI 5601

\*\*EQ:\*\* The former ENGI 5671

\*\*LH:\*\* At least six 3-hour sessions per semester

\*\*PR:\*\* PROC 4021 or the former ENGI 4621, PROC 4025 or the former ENGI 4625

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303694>

\*\*Course Title:\*\* PROC 5092 Chemistry and Physics of Engineering Materials

\*\*Course Information:\*\* PROC 5092 introduces the structure and properties of engineering materials, focusing on metals, alloys, semiconductors, ceramics, glasses, and polymers. Topics include a review of atomic bonding, discussion of basic crystalline and amorphous structures, phase diagrams, mechanical properties of materials. Selection of materials for process engineering applications, corrosion, and degradation of material will also be covered in the course.

\*\*CR:\*\* ME 3101, ME 5103

\*\*PR:\*\* Chemistry 1050 or Chemistry 1200

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303720>

\*\*Course Title:\*\* PROC 6025 Process Modelling and Simulation

\*\*Course Information:\*\* PROC 6025 introduces the concepts of process model building and its application in design and process operations. It includes the fundamentals of process modeling, lumped parameter dynamic models, distributed parameter dynamic models, application of process models, and computer-aided process design. The course provides hands-on experience to use a process simulator effectively for the development and analysis of flowsheets, mass and energy balances, sizing of individual equipment and process units including reactor, separator, and heat exchangers.

\*\*CR:\*\* The former ENGI 5621, the former ENGI 6621, the former PROC 6021

\*\*LH:\*\* Ten 3-hour sessions per semester

\*\*PR:\*\* PROC 4021 or the former ENGI 4621, PROC 4025 or the former ENGI 4625

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303722>

\*\*Course Title:\*\* PROC 6031 Chemical Reaction Engineering

\*\*Course Information:\*\* PROC 6031 covers the fundamentals of chemical kinetics and reaction rate expressions as well as the types of reactors, homogeneous and heterogeneous (catalytic) reactors, and the interrelation between transport phenomena and reaction engineering as it applies to process design. It also includes an overview of non-ideal reactors and an introduction to bioreactors.

\*\*EQ:\*\* The former ENGI 6631

\*\*LH:\*\* Four 2-hour sessions per semester

\*\*PR:\*\* PROC 4021 or the former ENGI 4621, PROC 4061 or the former ENGI 4661 or ME 4501 or the former ENGI 4961 or the former ENGI 5961

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303709>

\*\*Course Title:\*\* PROC 6061 Process Fluid Dynamics II

\*\*Course Information:\*\* PROC 6061 builds upon the materials introduced in Process Fluid Dynamics I. The course covers important aspects of fluid dynamics principles and applications in process engineering, including; continuity equation; differential governing equations of fluid momentum; conservation laws in chemical/process engineering; ideal and non-ideal flow; compressible and incompressible flow; boundary layer theory for laminar and turbulent flow; multiphase flow; introduction to CFD; turbomachinery; fluid flow features of unit operations.

\*\*CR:\*\* The former ENGI 5913, the former ENGI 5962, the former ENGI 6961

\*\*EQ:\*\* The former ENGI 6661

\*\*LH:\*\* Three 1-hour sessions per semester

\*\*PR:\*\* PROC 4061 or the former ENGI 4661 or ME 4501 or the former ENGI 4961 or the former ENGI 5961

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303696>

\*\*Course Title:\*\* PROC 6071 Process Equipment Design II

\*\*Course Information:\*\* PROC 6071 will cover the design and operation of equilibrium stage separation processes including distillation, extraction, and leaching. It will also cover advanced concepts of equipment design such as heterogeneous systems, multiphase systems, absorption, and adsorption operation and computer-assisted design. This course will use HYSIS and other process equipment design tools.

\*\*EQ:\*\* The former ENGI 6671

\*\*LH:\*\* At least four 2-hour sessions per semester

\*\*PR:\*\* PROC 5001 or the former ENGI 5601, PROC 5071 or the former ENGI 5671

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303717>

\*\*Course Title:\*\* PROC 6151 Sustainable Engineering in Processing Industries

\*\*Course Information:\*\* PROC 6151 will introduce students to sustainable development and its application to processing operations. Areas such as traditional economic growth, materials cycles, methods for measuring environmental impact, life cycle analysis, waste treatment technologies and recycling technologies will be covered. In addition, the concept of industrial ecology will be included.

\*\*EQ:\*\* The former ENGI 6651

\*\*PR:\*\* PROC 4025 or the former ENGI 4625, PROC 5001 or the former ENGI 5601

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303704>

\*\*Course Title:\*\* PROC 6202 Natural Resources Geology and Formation Evaluation

\*\*Course Information:\*\* PROC 6202 covers the fundamentals of petroleum geology, formation evaluation and well logging. Topics include rock types; economic minerals; sedimentary basins and formation; hydrocarbon traps and seals; reservoir fluids; well and core logging fundamentals; in situ stress; lithology identification and permeability; formation and fluid identification; formation density and porosity; pore fluids and saturation; integrated logging and resource evaluation.

\*\*EQ:\*\* The former ENGI 6602

\*\*PR:\*\* PROC 4061 or the former ENGI 4661 or ME 4501 or the former ENGI 4961 or the former ENGI 5961 or CIV 5110 or the former ENGI 5713

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303698>

\*\*Course Title:\*\* PROC 7021 Process Dynamics and Control

\*\*Course Information:\*\* PROC 7021 familiarizes students with the scientific and engineering principles of process dynamics and control. Students will apply and integrate knowledge of chemical engineering to identify, formulate and solve process dynamics problems and develop control systems. Modern computational techniques and tools will be used for solving chemical process control problems. Also, students will become familiar with industrial control systems.

\*\*EQ:\*\* The former ENGI 7621

\*\*LH:\*\* At least six 2-hour sessions per semester

\*\*PR:\*\* PROC 6025 or the former PROC 6021 or the former ENGI 6621 or the former ENGI 5621

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303716>

\*\*Course Title:\*\* PROC 7040 Process Engineering Project I

\*\*Course Information:\*\* PROC 7040 gives students the opportunity to apply the knowledge gained in previous design and technical courses to complete a high-level design of a process plant or major modification to a process plant. The goal is to expose students to process design, practical design issues, and to provide experience in the complete design process as applied to real devices. Students will work in groups to design a process system. This course is a precursor to PROC 8040.

\*\*EQ:\*\* The former ENGI 7640

\*\*LC:\*\* Scheduled as required

\*\*PR:\*\* ENGI 4102, PROC 6071 or the former ENGI 6671, completion of academic term 6 of the Process Engineering program

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303710>

\*\*Course Title:\*\* PROC 7077 Process Plant Design and Economics

\*\*Course Information:\*\* PROC 7077 provides a comprehensive picture of the availability and design of both traditional and current process equipment. Economic and optimization issues relevant to investment, product-cost estimation, and profitability analysis will also be addressed. The course equips students with tools to evaluate the economics of process industries reflecting current economic criteria and provides helpful guidelines for approaching, defining, and solving optimization problems.

\*\*EQ:\*\* The former ENGI 8677

\*\*PR:\*\* PROC 6071 or the former ENGI 6671

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303715>

\*\*Course Title:\*\* PROC 7123 Process Simulation

\*\*Course Information:\*\* Inactive course.

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303695>

\*\*Course Title:\*\* PROC 7125 Process Data Analytics

\*\*Course Information:\*\* PROC 7125 covers all necessary elements, beginning from data collection to model development, to conduct a data analysis project in a process plant. The course focuses on data quality evaluation and preprocessing of data to ensure the fidelity of data. A range of unsupervised techniques, including several variants of principal component analysis (PCA), support vector machine (SVM), and clustering algorithms, will be covered. Students will also receive hands-on training on various Matlab toolboxes and Python libraries.

\*\*CR:\*\* The former ENGI 7623, the former PROC 7123

\*\*PR:\*\* ENGI 4421 or Statistics 2550

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303724>

\*\*Course Title:\*\* PROC 7131 Advanced Reactor Design

\*\*Course Information:\*\* PROC 7131 builds on previous courses in reaction engineering with more analysis of reactor designs involving complex fluid flow and/or complex kinetics and catalysts. The course will also cover bioreactor design.

\*\*PR:\*\* PROC 6031 or the former ENGI 6631

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303699>

\*\*Course Title:\*\* PROC 7141 Bioprocess Engineering I

\*\*Course Information:\*\* PROC 7141 covers the fundamentals of chemical engineering applied to biomass/biological based processes, from valorization of virgin/waste biomass to biomass as the bioprocess. The focus is on bioprocessing as it relates to the natural resource industries and associated markets. The course covers the fundamentals related to biomass and bioprocessing including the composition of biomass and biomass processing (biochemical, thermochemical, chemical, and physical), and associated products. The course will highlight “green” processes that minimize waste and energy.

\*\*PR:\*\* PROC 5001 or the former ENGI 5601, PROC 5002 or the former ENGI 5602, PROC 6031 or the former ENGI 6631

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303719>

\*\*Course Title:\*\* PROC 7171 Safety and Risk Engineering

\*\*Course Information:\*\* PROC 7171 begins with an overview of safety and risk issues in the offshore oil and gas industry. The course examines regulatory requirements; hazards and structured analysis tools; risk terminology and quantified risk analysis (QRA) techniques; and safety assessment studies. The course includes project and case studies.

\*\*EQ:\*\* The former ENGI 8671

\*\*PR:\*\* ENGI 4421 or Statistics 2550 or registration in the Minor in Applied Science - Process Engineering

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303713>

\*\*Course Title:\*\* PROC 7291 Sustainable Oil Production & Gas Storage I

\*\*Course Information:\*\* PROC 7291 examines the fundamentals to sustainably producing fossil fuels, in-situ carbon utilization and sequestration, and hydrogen storage. Students will be able to describe rock and fluid properties then use their knowledge of Darcy’s Law and apply it to determine how much CO2/H2 can be stored or oil/gas produced. Students will learn material balances of single-phase flow in porous media, natural forces, well inflow and performance, and how to predict and maximize fluid injection and production.

\*\*EQ:\*\* The former ENGI 8691

\*\*PR:\*\* PROC 6061 or the former ENGI 6661 or ME 5502 or the former ENGI 5962 or CIV 5110 or the former ENGI 5713

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303712>

\*\*Course Title:\*\* PROC 7293 Mineral Processing and Tailings Management

\*\*Course Information:\*\* PROC 7293 covers the fundamentals of mineral processing and emerging practices and technologies that result in the generation of a mineral concentrate. Topics include rock fragmentation leading to run-of-mine ore, comminution and mineral liberation, sensor-based ore sorting, gravity separation, magnetic separation, electrical separation, froth flotation, dewatering, and tailings transportation and storage. Advanced topics include process simulation and control, practical processes of metallic and non-metallic ore dressing.

\*\*LH:\*\* At least five 3-hour sessions per semester

\*\*PR:\*\* PROC 5071 or the former ENGI 5671

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303707>

\*\*Course Title:\*\* PROC 8040 Process Engineering Project II

\*\*Course Information:\*\* PROC 8040 is a design project that illustrates the application of previous engineering science and design-related courses. Projects will be done by teams of students with individuals concentrating their participation in their own engineering discipline. The project topic will be from the process industry which includes the offshore oil and gas industry, mining and metal processing industry, and chemical process industry.

\*\*EQ:\*\* The former ENGI 8640

\*\*LC:\*\* Scheduled as required

\*\*PR:\*\* PROC 7040 or the former ENGI 7640

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303706>

\*\*Course Title:\*\* PROC 8125 Artificial Intelligence in Process Engineering

\*\*Course Information:\*\* PROC 8125 covers the fundamentals of machine learning and artificial intelligence relevant to process and petroleum engineering systems. Topics will include regression analysis, concepts of optimization for machine learning, Neural Network, Convolution Networks, Recurrent and Recursive Nets, Reinforcement Learning, as well as Statistical Machine Learning with a focus on the use of process data.

\*\*PR:\*\* ENGI 4421 or Statistics 2550

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303700>

\*\*Course Title:\*\* PROC 8141 Bioprocess Engineering II

\*\*Course Information:\*\* PROC 8141 focuses on the introduction of downstream bioprocessing, with applications covering biopharmaceutical manufacturing, extraction of oils from natural sources, minerals bioprocessing, and environmental applications. Bioseparation techniques using supercritical fluid extraction, crystallization, and liquid and ion-exchange chromatography will be covered in this course.

\*\*PR:\*\* PROC 7141

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303693>

\*\*Course Title:\*\* PROC 8151 Industrial Pollution Prevention and Control

\*\*Course Information:\*\* PROC 8151 is designed to introduce methods of industrial pollution assessment and control. Topics include waste characterization, water pollution assessment, water pollution control, air pollution assessment and control, solid waste assessment and control, pollution prevention, environmental risk assessment and risk-based decision-making.

\*\*EQ:\*\* The former ENGI 7651

\*\*PR:\*\* PROC 6151 or the former ENGI 6651, PROC 6071 or the former ENGI 6671

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303729>

\*\*Course Title:\*\* PROC 8170 Reliability Engineering

\*\*Course Information:\*\* PROC 8170 is an introduction to reliability engineering; physics of failure and failure mechanism, reliability measures and assessment; reliability of components and parts; complex system reliability and availability analysis; and field reliability assessment. The course includes case studies and a project.

\*\*EQ:\*\* The former ENGI 8670, the former PROC 8270

\*\*PR:\*\* ENGI 4421 or Statistics 2550

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303705>

\*\*Course Title:\*\* PROC 8276 Decarbonization Strategies in the Gas Industry

\*\*Course Information:\*\* PROC 8276 investigates the carbon emitted from the gas industry and how to reduce it. The course describes gas processes, design methods, operating procedures, and challenges of gas production, carbon capture facilities, and their use in blue hydrogen production. The course covers separation operations, hydrate prevention and control, gas dehydration, NGL recovery and dew point control, gas transmission and pipeline design and transportation systems.

\*\*EQ:\*\* The former ENGI 8676

\*\*PR:\*\* PROC 6061 or the former ENGI 6661 or ME 5502 or the former ENGI 5962 or CIV 5110 or the former ENGI 5713

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303703>

\*\*Course Title:\*\* PROC 8291 Sustainable Oil Production & Gas Storage II

\*\*Course Information:\*\* PROC 8291 continues to examine flow in porous media, expanding to multiphase flow and the challenges of producing and injecting fluids into a reservoir accounting for capillary pressure and phase behaviour. The course addresses flow assurance challenges, enhanced recovery methods, CO2 utilization and storage, as well as strategies to optimize production and gas injection.

\*\*EQ:\*\* The former ENGI 8690, the former PROC 8290

\*\*PR:\*\* PROC 7291

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303725>

\*\*Course Title:\*\* PROC 8292 Drilling Engineering

\*\*Course Information:\*\* PROC 8292 covers both offshore and onshore drilling operations and includes rotary drilling rig operations, well construction sequence, drill string, drill bits, well bore hydraulics, casing and well heads, cementing, well control, directional and horizontal drilling, well planning and fishing operations, and extended reach, horizontal and multilateral well drilling techniques.

\*\*EQ:\*\* The former ENGI 8692, the former PROC 7292

\*\*LH:\*\* Two 3-hour lab sessions per semester

\*\*PR:\*\* PROC 6202 or the former ENGI 6602

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303726>

\*\*Course Title:\*\* PROC 8293 Extractive Metallurgy

\*\*Course Information:\*\* PROC 8293 covers the fundamentals of pyrometallurgy, hydrometallurgy, and electrometallurgy that extract metals from ores and mineral concentrates. Topics include thermodynamics and reaction kinetics of extractive metallurgical processes, electrolytic reduction of molten salts, metal refining processes, materials preparation in the metallurgical industry, equipment selection and operation, and sustainable technologies and practices.

\*\*CR:\*\* The former ENGI 7691, the former PROC 8191

\*\*LH:\*\* At least four 2-hour sessions per semester

\*\*PR:\*\* PROC 7293

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303701>

\*\*Course Title:\*\* PROC 8294 Downstream Processing

\*\*Course Information:\*\* Inactive course.

\*\*Course Title:\*\* PROC 8296 Petroleum Refining Engineering

\*\*Course Information:\*\* Inactive course.

\*\*Course Title:\*\* PROC 8900-8999 Special Topics in Process Engineering

\*\*Course Information:\*\* PROC 8900-8999 encompasses special topics in process engineering. Topics to be studied are announced by the Department.

\*\*Course Link:\*\* <https://www.mun.ca/university-calendar/st-johns-campus/faculty-of-engineering-and-applied-science/11/6/#d.en.303727>