ENGINEERING PHYSICS, B.A.SC. (CLASS OF 2022)

Second Year Core 2019-2020

Code	Title	Units
APSC 200	Engineering Design & Practice II	4.00
APSC 293	Engineering Communications	1.00
ELEC 221	Electric Circuits	4.25
ENPH 211	Applied Physics	3.50
ENPH 213	Computational Eng. Physics	4.00
ENPH 225	Mechanics	3.50
ENPH 239	Eng. Electricity & Magnetism	3.50
ENPH 242	Relativity And Quanta	3.50
ENPH 252	Mangmt Of Experimental Data	1.25
ENPH 253	Engineering Physics Laboratory	3.50
MTHE 227	Vector Analysis	3.00
MTHE 237	Differential Equations for Engineering Science	3.25
Total Units		**38.25**

Electrical Sub-Plan (P1)

Code	Title	Units
Second Year Core		38.25
ELEC 252	Electronics I	4.25
ELEC 278	Fundamentals Of Information Structures	4.00
Total Units		**46.50**

Materials Sub-Plan (P3)

Code	Title	Units
Second Year Core		38.25
MECH 241	Fluid Mechanics I	3.50
MECH 270	Materials Science and Engineering	3.50
Total Units		**45.25**

Mechanical Sub-Plan (P4)

Code	Title	Units
Second Year Core		45.25
MECH 230	Applied Thermodynamics I	3.50
MECH 241	Fluid Mechanics I	3.50
Total Units		**52.25**

Computing Sub-Plan (P6)

Code	Title	Units
Second Year Core		45.25
CMPE 212	Introduction to Computing Science II	4.00
ELEC 278	Fundamentals Of Information Structures	4.00
Total Units		**53.25**

Third Year Core 2020-2021

Code	Title	Units
APSC 221	Economic And Business Practice	3.00
ENPH 316	Mathematical Methods in Physics I	3.50
ENPH 344	Intro. To Quantum Mechanics	3.50
ENPH 345	Quantum Physics Of Atoms	3.50
ENPH 354	Engineering Physics Design Project	3.50
Total Units		**17.00**

[1] MTHE 338 (https://calendar.engineering.queensu.ca/preview_program.php?catoid=9&poid=546&returnto=232#tt9536) may be replaced by taking ENPH 316 (https://calendar.engineering.queensu.ca/preview_program.php?catoid=9&poid=546&returnto=232#tt4350) and ENPH 317 (https://calendar.engineering.queensu.ca/preview_program.php?catoid=9&poid=546&returnto=232#tt6067). However, in 2020-2021, MTHE 338 will not be offered. ENPH 317 can be taken in 3rd or 4th year and is a Physics List A elective.

** Students are free to take Complementary Studies courses at any time in their program that suits their interests, workloads, and schedules. Read explanatory notes on Complementary Studies at the end of this section.

Notes:

APSC 303 Professional Internship may be taken as a List B technical elective for students that have successfully completed the internship program (QUIP).

APSC 381 Advanced Design and Skills for Innovation may be taken as a technical elective for students particularly interested in engineering design.

ENPH 491 (https://calendar.engineering.queensu.ca/preview_program.php?catoid=9&poid=546&returnto=232#tt777) and ENPH 495 (https://calendar.engineering.queensu.ca/preview_program.php?catoid=9&poid=546&returnto=232#tt5027) are fourth year Physics List A electives offered every second year which students in their third year can consider taking.

Note: Note: In the third year of the Engineering Physics program students may apply to the Accelerated Masters program. In this program, students work closely with a

supervisor in the summer after the third year of school doing research that leads towards a Masters degree in Physics or Engineering Physics. To accelerate students' progress towards a Masters degree, students take two graduate courses in their fourth year. These courses replace the Engineering Elective and a List "A" or List "B" course in the undergraduate program. Students enroll in ENPH 555 for their undergraduate thesis instead of ENPH 455. Students are admitted based on a minimum GPA of 3.7 and acceptance by a supervisor. Students are expected to finish their full Masters degree within 16 months after the undergraduate program, saving a year of time. For details see http://queensu.ca/physics/undergrad-studies/accelerated-msc-masc

Electrical Sub-Plan (P1)

Code	Title	Units
Third Year Core		17.00
ELEC 353	Electronics II	4.25
ENPH 336	Solid State Devices	3.25
ENPH 372	Thermodynamics	3.50
ELEC 271	Digital Systems	4.00
ELEC 274	Computer Architecture	4.00
Total Units		**36.00**

Materials Sub-Plan (P3)

Code	Title	Units
Third Year Core		17.00
ENPH 334	Electronics For Applied Scient	5.00
ENPH 372	Thermodynamics	3.50
MECH 370	Prin Of Materials Processing	3.50
MECH 371	Fracture Mech & Dislocation	3.50
MECH 397	Mech And Material Eng Lab II	2.00
Total Units		**34.50**

Mechanical Sub-Plan (P4)

Code	Title	Units
Third Year Core		17.00
ENPH 334	Electronics For Applied Scient	5.00
MECH 330	Applied Thermo II	3.50
MECH 341	Fluid Mechanics II	3.50
MECH 346	Heat Transfer	3.50
MECH 350	Automatic Control	3.50
Total Units		**36.00**

Computing Sub-Plan (P6)

Code	Title	Units
Third Year Core		17.00
ELEC 271	Digital Systems	4.00
ELEC 274	Computer Architecture	4.00
ENPH 334	Electronics For Applied Scient	5.00
ENPH 372	Thermodynamics	3.50
Total Units		**33.50**

Fourth Year Core 2021-2022

Code	Title	Units
ENPH 431	Electromagnetic Theory	3.50
ENPH 453	Advanced Physics Laboratory	3.50
ENPH 454	Advanced Engineering Physics Design Project	4.50
ENPH 455	Engineering Physics Thesis	4.00
Engineering Elective (any 200- 300- or 400-level Engineering and Applied Science course)		3.00
Total Units		**18.50**

Notes:

* Students may take ENPH 555 as an alternative to ENPH 455 (https://engineering_queensu.acalogadmin.com/preview/preview_program.php?catoid=10&progoid=611&preview#tt6505). See the Notes regarding the Accelerated Masters program after the 3rd year program listing.

** Students may instead take APSC 480 (https://engineering_queensu.acalogadmin.com/preview/preview_program.php?catoid=10&progoid=611&preview#tt7985) Multi-disciplinary Industry Engineering Design Project (9 credits FW) as a substitute for ENPH 454 (https://engineering_queensu.acalogadmin.com/preview/preview_program.php?catoid=10&progoid=611&preview#tt4536) and one list "B" course. Note that APSC 480 (https://engineering_queensu.acalogadmin.com/preview/preview_program.php?catoid=10&progoid=611&preview#tt4280) has a prerequisite of APSC 381 (https://engineering_queensu.acalogadmin.com/preview/preview_program.php?catoid=10&progoid=611&preview#tt8150) or permission of the instructor.

Physics List A

One from Physics List A:

Code	Title	Units
ENPH 317	Mathematical Methods in Physics II	3.50
ENPH 321	Advanced Mechanics	3.50
ENPH 414	Introducation to General Relativity	3.00
ENPH 460	Laser Optics	3.50
ENPH 472	Statistical Mechanics	3.50
ENPH 479	High Performance Computational Physics	3.00
ENPH 480	Solid State Physics	3.50
ENPH 483	Nanoscience & Nanotechnology	3.50
ENPH 490	Nuclear And Particle Physics	3.50
ENPH 491	Physics Of Nuclear Reactors	3.50
ENPH 495	Intro To Medical Physics	3.00

Electrical Sub-Plan (P1)

Two courses from Electrical List B, and one course from Electrical List B or Physics List A, at least one of which must be numbered above 400[1].

Electrical List B

Code	Title	Units
ELEC 326	Probability & Random Processes	3.50
ELEC 333	Electric Machines	4.25
ELEC 344	Sensors and Actuators	3.75
ELEC 373	Computer Networks	3.50
ELEC 408	Biomedical Signal and Image Processing	3.00
ELEC 409	Bioinformatic Analytics	3.00
ELEC 421	Digital Signal Processing: Filters and System Design	4.00
ELEC 422	Digital Signal Processing: Random Models and Applications	3.50
ELEC 431	Power Electronics	3.25
ELEC 443	Linear Control Systems	4.25
ELEC 448	Introduction To Robotics	3.50
ELEC 451	Digital Integrated Circuit Engineering	3.25
ELEC 454	Analog Electronics	3.25
ELEC 457	Integrated Circuits and System Application	3.25
ELEC 461	Digital Communications	3.50
ELEC 464	Wireless Communications	3.00
ELEC 483	Microwave and RF Circuits and Systems	4.25
ELEC 486	Fiber Optic Communication	3.75
CHEE 340	Biomedical Engineering	3.50

* Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other options within Engineering Physics.

Minimum Units: 36.5

Materials Sub-Plan (P3)

Code	Title	Units
ENPH 480	Solid State Physics	3.50

Materials List B

Two courses from Materials List B[1]:

Code	Title	Units
MECH 437	Fuel Cell Technology	3.50
MECH 423	Introduction To Microsystems	3.50
MECH 470	Deformation Processing	3.50
MECH 476	Eng Of Polymers And Composite	3.50
MECH 478	Biomaterials	3.50
MECH 479	Nano-Structured Materials	3.50
MECH 483	Nuclear Materials	3.50
CHEE 340	Biomedical Engineering	3.50

[1] Students with the necessary prerequisites and/or permission of the instructor may replace a list B course above with a list B course from one of the other options within Engineering Physics.

Minimum Units: 38

Mechanical Sub-Plan (P4)

Three courses: two from Mechanical List B, and one from Physics List A or Mechanical List B[1]:

Mechanical List B

Code	Title	Units
CHEE 340	Biomedical Engineering	3.50
MECH 420	Vibrations	3.50
MECH 423	Introduction To Microsystems	3.50
MECH 424	Sustainable Product Design	3.50
MECH 430	Thermal Systems Design	4.00
MECH 435	Internal Combustion Engines	3.50
MECH 437	Fuel Cell Technology	3.50
MECH 439	Turbomachinery	3.50
MECH 441	Fluid Mechanics III	3.50
MECH 444	Computational Fluid Dynamics	3.50
MECH 448	Compressible Fluid Flow	3.50
MECH 452	Mechatronics Engineering	5.00
MECH 456	Introduction To Robotics	3.50
MECH 465	Computer Aided Design	3.50
MECH 480	Airplane Aerodynamics and Performance	3.50
MECH 481	Wind Energy	3.50
MECH 482	Noise Control	3.50

MECH 492	Biological Fluid Dynamics	3.50
MECH 495	Ergonomics And Design	3.50

[1] Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other options within Engineering Physics.

Minimum Units: 37.5

Computing Sub-Plan (P6)

Three courses: two from Computing List B and one from Physics List A or Computing List B. At least one of the Computing List B courses must be numbered above 400[1]:

Computing List B

Code	Title	Units
CHEE 340	Biomedical Engineering	3.50
CMPE 330	Computer-Integrated Surgery	3.00
CMPE 365	Algorithms I	4.00
CMPE 452	Neural Networks and Genetic Algorithms	3.00
CMPE 454	Computer Graphics	3.00
CMPE 457	Image Processing & Computer	3.00
CMPE 458	Programming Language Processor	4.00
CMPE 472	Medical Informatics	3.00
ELEC 371	Microprocessor Interfacing and Embedded Systems	4.00
ELEC 374	Digital Systems Engineering	4.25
ELEC 377	Operating Systems	4.00
ELEC 408	Biomedical Signal and Image Processing	3.00
ELEC 409	Bioinformatic Analytics	3.00

[1] Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other sub-plans within Engineering Physics.

Minimum Units: 39.5

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering programs. For the Engineering Physics Plan, the Engineering Economics course is APSC 221 Economic And Business Practice, and the Communications requirements are met through courses in the core plan.