

# The Degree of Bachelor of Engineering with Honours (BE(Hons) – 480 points)

These regulations must be read in conjunction with the General Regulations for the University.

## 1. Version

These Regulations came into force on 1 January 2018.

## 2. Variations

In exceptional circumstances the Amo Pūkaha | College of Engineering Dean (Academic) may approve a personal programme of study which does not conform to these Regulations.

## 3. The structure of the qualification

To qualify for the BE(Hons) a student must complete:

- a programme of study for First Year of not less than 120 points;
- an approved academic writing test;
- a Second, Third and Fourth Year programme where each year is not less than 120 points;
- a programme of study which must include not less than 120 points at 400-level or higher;
- ENGR 200 Engineering Work Experience.

## 4. Admission to the qualification

- Admission to the BE(Hons) is by approval of the Amo Pūkaha | College of Engineering Dean (Academic).
- In addition, and principally on the basis of grades obtained, a student may qualify for admission to the Second Year programmes upon:
  - successful completion of the First Year Programme; or
  - successful completion of an approved First Year Programme at another university; or
  - completion of appropriate NCEA Level 3 subjects, or the New Zealand University Entrance, Scholarships qualification in appropriate subjects, or in other examinations approved by the Amo Pūkaha | College of Engineering Dean (Academic); or
  - completion of a qualification from a tertiary institution.
- Notwithstanding Regulation 3 above, unless exempted from the First Year, a student will not be admitted to the Second Year without passing the whole First Year requirements in two years or less.
- The entire BE(Hons) First Year is a prerequisite for the Second Year.
- The Amo Pūkaha | College of Engineering Dean (Academic) reserves the right to decline entry to a student who has been offered a place in the Second Year of the BE(Hons) degree and who has not completed their enrolment by the Friday preceding the first day of lectures of Semester 1.
- Special admission on the basis of Regulation 4(b)(iii) must be made by written application to the Amo Pūkaha | College of Engineering Dean (Academic). An interview may also be required.
- Special admission on the basis of Regulation 4(b)(iv) must be made by written application to the Amo Pūkaha College of Engineering Dean (Academic). The Amo | Dean, in consultation with the relevant department Year Coordinator or Director of Studies, will consider the student's prior learning. In particular, their preparation in mathematics, physics, chemistry or computer science, and any relevant work experience in industry.

## 5. Subjects

- This qualification may be awarded in the following disciplines: Chemical and Process Engineering, Civil Engineering, Computer Engineering, Electrical and Electronic Engineering, Forest Engineering, Mechanical Engineering, Mechatronics Engineering, Natural Resources Engineering, and Software Engineering.
- The degree may also be completed with a minor in certain sub-disciplines.

## 6. Time limits

- The time limit for completion of the Second, Third and Fourth Years and work experience requirements of this qualification is 6 years of study.
- Enrolment must be full-time unless approved by the Amo Pūkaha | College of Engineering Dean (Academic).
- In the case of a student pursuing double degrees or suspension of studies, qualification timelines may be extended if approved by the Amo Pūkaha | College of Engineering Dean (Academic).

- (d) A student who has an approved suspension of study for more than a calendar year may be required to undertake preparatory work prior to resuming studies in this qualification. Any preparatory programme of study must be completed while on suspension, and immediately prior to the end of their suspension.

### 7. Transfers of credit, substitutions and cross-credits

This qualification adheres to the Credit Recognition and Transfer Regulations, with no additional stipulations.

### 8. Progression

This qualification adheres to the General Regulations for the University, with the following stipulations:

- Introductory courses for Mathematics, Physics and Chemistry (MATH 101, PHYS 111 and CHEM 114) may only be attempted twice in the BE(Hons) First Year. Students who fail introductory courses after the second attempt will be excluded from the BE(Hons) First Year.
- A student is not permitted to enrol in any engineering courses of the Fourth Year prior to completion of the Second Year.
- A student may enquire, from the Amo Pūkaha | College of Engineering Dean (Academic), as to the College of Engineering Guideline on the application of restricted credit as described in the General Conditions for Credit Regulations.

### 9. Honours, Distinction and Merit

- The BE(Hons) may be awarded with First, Second, or with Third Class Honours. Second Class Honours must be listed in Division I or Division II.
- Honours is awarded for academic achievement, measured by weighted GPA, 20% weighting on the Third Year and 80% on the Fourth Year, and completion of requirements within the time limitations of the BE(Hons). Where students have completed courses on exchange, these grades will be used in the calculation of honours. Only the first attempt of a course, or its substitute, will be considered in the calculation.
- To be eligible for First or Second Class Honours a student must either:
  - if entering the programme at the Second Year, complete the Second, Third and Fourth Years in no more than four years of study, or
  - if entering the programme at the Third Year, complete the Third and Fourth Years in no more than three years of study.
  - a student who is approved into part-time study must complete the Third and Fourth Years in no more than four years of study. Approval into part-time study must be obtained prior to entering the Third Year.
- Those candidates not eligible for First or Second Class Honours, but having met all requirements, will be eligible for the award of Third Class Honours.
- In exceptional circumstances a student may be permitted by the Amo Pūkaha | College of Engineering Dean (Academic) to complete all the requirements, both academic and non-academic, of the award outside the time limitation. In such circumstances the student will be awarded a Degree of Bachelor of Engineering.

### 10. Exit and Upgrade Pathways to other Qualifications

There are no advancing qualifications for the BE or BE(Hons).

### 11. First Year

- The Programme of Study consists of:
  - All courses in Schedule A.
  - Courses from Schedule B to meet the entry requirements of at least one engineering discipline.
  - Additional courses, where required, to ensure a workload of not less than 120 points.
  - Subject to the approval of the Amo Pūkaha | College of Engineering Dean (Academic), a student may be approved into a modified First Year based on high achievement in NCEA or other equivalent examination, or through recognised prior learning at another tertiary institution.
- Schedule A – Compulsory for all Engineering First Year students
  - ENGR 100 Engineering Academic Skills\*
  - ENGR 101 Foundations of Engineering
  - EMTH 118 Engineering Mathematics 1A
  - EMTH 119 Engineering Mathematics 1B
  - PHYS 101 Engineering Physics A: Mechanics, Waves and Thermal Physics
  - COSC 131 Introduction to Programming for Engineers

\*ENGR 100 is a zero-EFTS course (no fees).

- (c) Schedule B – Engineering disciplines
- i. Chemical and Process Engineering
    - a. CHEM 111 Chemical Principles and Processes
  - ii. Civil Engineering, Forest Engineering, Mechanical Engineering, and Natural Resources Engineering
    - a. CHEM 111 Chemical Principles and Processes
    - b. ENGR 102 Engineering Mechanics
  - iii. Computer Engineering, and Electrical and Electronic Engineering
    - a. MATH 120 Discrete Mathematics, or COSC 122 Introduction to Computer Science
  - iv. Mechatronics Engineering
    - a. ENGR 102 Engineering Mechanics
  - v. Software Engineering
    - a. COSC 122 Introduction to Computer Science
    - b. MATH 120 Discrete Mathematics

## 12. Second to Fourth Year Programme

The Second to Fourth Years are laid out in Regulations 13–42.

A student should note the following:

- (a) Not all elective courses will necessarily be available in any one year.
- (b) A student may not attempt the Fourth Year project unless they will be completing their degree within 3 semesters or less.

### *Chemical and Process Engineering*

#### 13. Second Year

- (1) ENCH 199 Workshop Training Course for Chemical and Process Engineering
- (2) ENCH 241 Engineering Chemistry 2
- (3) ENCH 281 Principles of Biology for Engineers
- (4) ENCH 291 Mass & Energy Balances
- (5) ENCH 292 Heat & Mass Transfer Operations
- (6) ENCH 293 Fluid Mechanics 1
- (7) ENCH 295 Chemical Engineering Professional Practice
- (8) ENCH 296 Chemical Engineering Thermodynamics
- (9) ENCH 298 Chemical Engineering Mathematics

#### 14. Third Year

- (1) ENCH 390 Process Analysis
- (2) ENCH 391 Process Systems and Control
- (3) ENCH 392 Thermodynamics and Chemical Reaction Engineering
- (4) ENCH 393 Fluid Mechanics and Heat Transfer
- (5) ENCH 394 Process Engineering Design 2
- (6) ENCH 395 Process Engineering Laboratories
- (7) ENCH 396 Chemical Engineering Separations 1
- (8) One course selected from Schedule A listed below.

#### 15. Fourth Year

- (1) ENCH 494 Process Engineering Design 3
- (2) ENCH 495 Research Project
- (3) ENCH 496 Advanced Separation
- (4) ENCH 497 Process Management
- (5) One course selected from Schedule B listed below
- (6) One course selected from either Schedule A or B listed below or any 400-level 15 point Engineering course

#### Schedule A

- (1) ENGR 404 Renewable Energy Technologies and Management
- (2) ENCN 375 Sustainable Engineering for a Changing Climate

- (3) ENGR 407 Bioprocess Engineering 1
- (4) ENCH 486 Special Topic in Chemical and Process Engineering
- (5) ENNR 405 Ecological and Bioresources Engineering

#### Schedule B

- (1) ENGR 401 Computational Fluid Dynamics
- (2) ENGR 405 Industrial Pollution Control
- (3) ENCH 482 Bioprocess Engineering 2
- (4) ENCH 483 Advanced Energy Processing Technologies and Systems
- (5) ENCH 487 Special Topic in Chemical and Process Engineering
- (6) ENCH 484 Advanced Modelling and Simulation
- (7) Any 400-level Engineering course approved by the Director of Studies

#### 16. Minor in Bioprocess Engineering

- (1) ENCH 281 Principles of Biology for Engineers
- (2) ENGR 407 Bioprocess Engineering 1
- (3) ENCH 482 Bioprocess Engineering 2
- (4) ENCH 494 Process Engineering Design 3\*
- (5) ENCH 495 Research Project\*

\*Note: ENCH 494 Process Engineering Design 3 or ENCH 495 Research Project must be taken with an approved bioprocess engineering focus as approved by the Director of Studies. The Minor will only be awarded upon completion of all other normal requirement of BE(Hons) Chemical and Process Engineering.

#### 17. Minor in Energy Processing Technologies

- (1) ENCH 392 Thermodynamics and Chemical Reaction Engineering
- (2) ENGR 404 Emerging Energy Technologies and Management
- (3) ENCH 483 Advanced Energy Processing Technologies and Systems
- (4) ENCH 494 Process Engineering Design 3\*\* OR ENCH 495 Research Project\*\*

\*\*Note: ENCH 494 Process Engineering Design 3 and ENCH 495 Research Project must be taken with an approved energy processing technologies focus as approved by the Director of Studies. The Minor will only be awarded upon completion of all other normal requirement of BE(Hons) Chemical and Process Engineering.

#### 18. Minor in Environmental Process Engineering

- (1) ENCH 390 Process Engineering Design 1
- (2) One of the following courses
  - (a) ENGR 407 Bioprocess Engineering 1; or
  - (b) ENCN 375 Sustainable Engineering for a Changing Climate
- (3) ENGR 405 Industrial Pollution Control
- (4) ENCH 494 Process Engineering Design 3\*\*\*
- (5) ENCH 495 Research Project\*\*\*

\*\*\*Note: ENCH 494 Process Engineering Design 3 or ENCH 495 Research Project must be taken with an approved Environmental Process Engineering focus as approved by the Director of Studies. The Minor will only be awarded upon completion of all other normal requirement of BE(Hons) Chemical and Process Engineering.

#### Civil Engineering

##### 19. Second Year

- (1) ENCI 199 Health & Safety on the Worksite
- (2) ENCN 201 Communication Skills Portfolio 1
- (3) EMTH 210 Engineering Mathematics 2
- (4) ENCN 213 Design Studio 1
- (5) ENCN 221 Engineering Materials
- (6) ENCN 231 Solid Mechanics
- (7) ENCN 242 Fluid Mechanics and Hydrology
- (8) ENCN 253 Soil Mechanics

- (9) ENCN 261 Transport and Surveying
- (10) ENCN 281 Environmental Engineering

*Note: A student is required to attend the First Professional Examination Camp. Work at the camp will form part of the assessment for ENCN 261 Transport and Surveying.*

## 20. Third Year

- (1) ENCN 301 Communication Skills Portfolio 2
- (2) ENCI 335 Structural Analysis and Systems 1
- (3) ENCN 304 Deterministic Mathematical Methods
- (4) ENCN 305 Programming, Statistics and Optimization
- (5) ENCN 342 Hydraulics and Applied Hydrology
- (6) ENCN 353 Geotechnical Engineering
- (7) ENCN 371 Project and Infrastructure Management
- (8) ENCN 375 Sustainable Engineering for a Changing Climate
- (9) Either:
  - (a) ENCI 336 Behaviour and Design of Structures 1, or
  - (b) ENCN 347 Stormwater Systems Engineering

## 21. Fourth Year

- (1) ENCN 493 Project
- (2) ENCI 413 Integrated Civil Engineering Design
- (3) Sufficient courses selected from:
  - (a) ENCI 436 Behaviour and Design of Structures 2
  - (b) ENCI 437 Structural Analysis and Systems 2
  - (c) ENCI 438 Introduction to Structural Earthquake Engineering
  - (d) ENCN 401 Engineering in Developing Communities
  - (e) ENCN 412 Traffic Engineering
  - (f) ENCN 415 Pavement Engineering
  - (g) ENCN 444 Water Infrastructure Systems Design
  - (h) ENCN 445 Fluid Mechanics of Environmental Systems
  - (i) ENCN 452 Advanced Geotechnical Engineering
  - (j) ENCN 454 Introduction to Geotechnical Earthquake Engineering
  - (k) ENCN 481 Water and Wastewater Treatment Systems
  - (l) ENNR 423 Sustainable Energy Systems
  - (m) ENGR 403 Fire Engineering
  - (n) Any 15 point 400-level option to be approved by the Director of Studies
  - (o) Students with a GPA of 6 or more may apply to take one 600-level course approved by the Director of Studies.

## 22. Minor in Structural Engineering

- (1) ENCI 436 Behaviour and Design of Structures 2
- (2) ENCI 437 Structural Analysis and Systems 2 or ENCI 438 Introduction to Structural Earthquake Engineering
- (3) ENCN 493 Research Project\*

*\*Note: ENCN 493 Research Project have a structural engineering focus as approved by the Director of Studies. The Minor will only be awarded upon completion of all other normal requirements of BE(Hons) Civil Engineering.*

## 23. Minor in Water and Environmental Systems Engineering

- (1) Three of the following courses:
  - (a) ENCN 444 Water Infrastructure Systems Design
  - (b) ENCN 445 Fluid Mechanics of Environmental Systems
  - (c) ENNR 422 Water Resources and Irrigation Engineering
  - (d) ENCN 481 Water and Wastewater Treatment Systems
  - (e) ENNR 405 Ecologically Engineered Designs
  - (f) An appropriate course approved by the Director of Studies

## (2) ENCN 493 Research Project\*\*

\*\*Note: ENCN 493 Research Project must have a Water and Environmental Systems Engineering focus as approved by the Director of Studies. The Minor will only be awarded upon completion of all other normal requirements of BE(Hons) Civil Engineering.

**Computer Engineering****24. Second Year**

- (1) ENEL 198 Electrical Workshop Course
- (2) ENEL 199 Basic Workshop Course
- (3) EMTH 210 Engineering Mathematics 2
- (4) EMTH 211 Engineering Linear Algebra and Statistics
- (5) ENCE 260 Computer Systems
- (6) ENEL 200 Electrical and Computer Engineering Design
- (7) ENEL 220 Circuits and Signals
- (8) ENEL 270 Principles of Electronics and Devices
- (9) SENG 201 Software Engineering 1
- (10) Either:
  - (a) COSC 264 Introduction to Computer Networks and the Internet, or
  - (b) COSC 265 Relational Database Systems

**25. Third Year**

- (1) ENCE 361 Embedded Systems 1
- (2) ENEL 300 Electrical and Computer Engineering Design 2
- (3) ENEL 301 Fundamentals of Engineering Economics and Management
- (4) ENEL 320 Signals and Communications
- (5) ENEL 321 Control Systems
- (6) ENEL 373 Digital Electronics and Devices
- (7) Sufficient courses selected from:
  - (a) ENCE 360 Operating Systems
  - (b) COSC 362 Data and Network Security
  - (c) COSC 363 Computer Graphics
  - (d) COSC 364 Internet Technology and Engineering
  - (e) COSC 368 Humans and Computers
  - (f) SENG 301 Software Engineering 2
  - (g) SENG 365 Web Computing Architectures
  - (h) Any 15 point 300-level option to be approved by the Director of Studies

**26. Fourth Year**

- (1) ENEL 400 Electrical and Computer Engineering Research Project
- (2) ENCE 461 Embedded Systems 2
- (3) ENCE 464 Embedded Software and Advanced Computing
- (4) Sufficient courses selected from:
  - (a) COSC 411 Advanced Topics in HCI
  - (b) COSC 422 Advanced Computer Graphics
  - (c) COSC 424 Secure Software
  - (d) COSC 428 Computer Vision
  - (e) COSC 441 Wireless Networking Systems and Performance
  - (f) ENEL 420 Advanced Signals
  - (g) ENEL 422 Communications Engineering
  - (h) ENEL 491 Nano Engineered Electronics Devices
  - (i) ENME 403 Linear Systems Control and System Identification
  - (j) ENMT 482 Robotics
  - (k) Any 15 point 400-level option to be approved by the Director of Studies

**27. Minor in Communications and Network Engineering**

- (1) COSC 264 Introduction to Computer Networks and the Internet
- (2) COSC 364 Internet Technology and Engineering
- (3) COSC 441 Wireless Networking Systems and Performance
- (4) ENEL 320 Signals and Communications
- (5) ENEL 400 Electrical and Computer Engineering Research Project
- (6) ENEL 422 Communications Engineering

*Electrical and Electronic Engineering***28. Second Year**

- (1) ENEL 198 Electrical Workshop Course
- (2) ENEL 199 Basic Workshop Course
- (3) EMTH 210 Engineering Mathematics 2
- (4) EMTH 211 Engineering Linear Algebra and Statistics
- (5) ENEL 200 Electrical and Computer Engineering Design
- (6) ENEL 220 Circuits and Signals
- (7) ENEL 270 Principles of Electronics and Devices
- (8) ENEL 280 Principles of Electrical Systems
- (9) ENEL 290 Waves and Materials in Electrical Engineering
- (10) ENCE 260 Computer Systems

**29. Third Year**

- (1) ENCE 361 Embedded Systems 1
- (2) ENEL 300 Electrical and Computer Engineering Design 2
- (3) ENEL 301 Fundamentals of Engineering Economics and Management
- (4) ENEL 320 Signals and Communications
- (5) ENEL 321 Control Systems
- (6) ENEL 372 Power and Analogue Electronics
- (7) ENEL 373 Digital Electronics and Devices
- (8) ENEL 382 Electric Power and Machines

**30. Fourth Year**

- (1) ENEL 400 Electrical and Computer Research Project
- (2) Sufficient courses selected from:
  - (a) ENCE 461 Embedded Systems 2
  - (b) ENCE 464 Embedded Software and Advanced Computing
  - (c) ENEL 420 Advanced Signals
  - (d) ENEL 422 Communications Engineering
  - (e) ENEL 471 Power Electronics 2
  - (f) ENEL 480 Electrical Power Systems
  - (g) ENEL 481 Electrical Machines
  - (h) ENEL 491 Nano Engineered Electronics
  - (i) ENEL 667 Renewable Electricity System Design
  - (j) ENME 403 Linear Systems Control and System Identification
  - (k) ENMT 482 Robotics
  - (l) Any 15 point 400-level or higher option to be approved by the Director of Studies

**31. Minor in Power Engineering**

- (1) ENEL 480 Power Systems
- (2) ENEL 372 Power and Analogue Electronics
- (3) ENEL 382 Electric Power and Machines
- (4) And two of the following:
  - (a) ENEL 481 Electrical Machines
  - (b) ENEL 471 Power Electronics
  - (c) ENEL 667 Renewable Energy Systems Design

## Forest Engineering

### 32. Second Year

- (1) FORE 199 Workshop Training Course
- (2) EMTH 210 Engineering Mathematics 2
- (3) FORE 205 Introduction to Forest Engineering
- (4) FORE 215 Introduction to Forest Economics
- (5) ENCN 213 Design Studio 1
- (6) ENCN 221 Engineering Materials
- (7) ENCN 231 Solid Mechanics
- (8) ENCN 253 Soil Mechanics
- (9) ENFO 204 Forest Measurement

### 33. Third Year

- (1) ENCN 305 Computer Programming and Stochastic Modelling
- (2) ENCN 353 Geotechnical Engineering
- (3) ENCN 371 Project and Infrastructure Management
- (4) ENFO 327 Wood Science
- (5) ENNR 320 Integrated Catchment Analysis or ENCI 335 Structural Analyses
- (6) FORE 316 Forest Management
- (7) FORE 342 Geospatial Science in Forest Monitoring and Management

Note: A student is required to attend the Third Year Camp. Work at the camp will form part of the assessment for ENCN 371 Infrastructure Management.

### 34. Fourth Year

- (1) FORE 422 Forest Harvest Planning
- (2) FORE 423 Forest Transportation and Road Design
- (3) ENFO 410 Forest Engineering Research
- (4) ENFO 499 Industry Field Programme (0 points)
- (5) Sufficient courses selected from:
  - (a) FORE 426 Forest Products Marketing and International Trade
  - (b) FORE 435 Advanced Forest Economics 2
  - (c) FORE 443 Biosecurity Risk Management
  - (d) ENGR 403 Fire Engineering
  - (e) ENGR 406 Wood and Engineered Wood Products Processing
  - (f) ENNR 423 Sustainable Energy Systems
  - (g) ENCN 415 Pavement Engineering
  - (h) ENCN 452 Advanced Geotechnical Engineering
  - (i) ENGE 412 Rock Mechanics and Rock Engineering
  - (j) Any 15 point 400-level option to be approved by the Director of Studies

## Mechanical Engineering

### 35. Second Year

- (1) ENME 199 Workshop Training Course for Mechanical and Mechatronics Engineering
- (2) EMTH 210 Engineering Mathematics 2
- (3) EMTH 271 Mathematical Modelling and Computation 2
- (4) ENME 201 Design Communication
- (5) ENME 202 Stress, Strain and Deformation in Machine Elements
- (6) ENME 203 Dynamics and Vibrations
- (7) ENME 207 Materials Science and Engineering
- (8) ENME 215 Engineering Thermodynamics
- (9) ENME 221 Engineering Design and Manufacture

### 36. Third Year

- (1) ENME 301 Engineering Design and Production Quality



- (2) ENME 302 Computational and Applied Mechanical Analysis
- (3) ENME 303 Controls and Vibrations
- (4) ENME 307 Performance of Engineering Materials
- (5) ENME 311 Engineering Design and Production Management
- (6) ENME 313 Electro Technology for Mechanical Engineers
- (7) ENME 314 Fluid Mechanics
- (8) ENME 315 Heat Transfer
- (9) ENME 351 Biomedical Design & Production Management

### 37. Fourth Year

- (1) ENME 408 Honours Research and Development Project
- (2) ENME 401 Mechanical Systems Design
- (3) ENME 418 Engineering Management and Professional Practice for Mechanical Engineers
- (4) Sufficient courses selected from:
  - (a) ENGR 401 Computational Fluid Dynamics
  - (b) ENME 402 Acoustics and Vibrations
  - (c) ENME 403 Linear Systems Control and System Identification
  - (d) ENME 404 Aerodynamics and Ground Vehicle Dynamics
  - (e) ENME 405 Energy Systems Engineering
  - (f) ENME 406 Engineering Product Design and Analysis
  - (g) ENME 407 Advanced Materials Science and Engineering
  - (h) ENME 409 Physiological Modelling
  - (i) ENME 411 Advanced Mechanical System Design
  - (j) ENME 412 Advanced Vibrations
  - (k) ENME 417 Advanced Composite, Polymeric and Ceramic Materials
  - (l) ENME 423 Instrumentation and Sensors
  - (m) ENME 460 Aerospace Propulsion
  - (n) ENME 480 Independent Course of Study
  - (o) ENME 481 Special Topic – Materials That Shape Civilization
  - (p) ENME 484 Special Topic – Industry 4.0 Intelligent Manufacturing
  - (q) MDPH 401 Anatomy and Physiology
  - (r) ENMT 482 Robotics
  - (s) Any 15 point 400-level option approved by the Director of Studies

### 38. Minor in Biomedical Engineering

- (1) ENME 351 Biomedical Design & Production Management
- (2) ENME 401 Mechanical Systems Design
- (3) ENME 408 Honours Research & Development Project
- (4) ENME 418 Engineering Management and Professional Practice for Mechanical Engineers
- (5) MDPH 401 Anatomy and Physiology

Plus 15 points of the following:

- (1) DATA 430 Medical Data Informatics
- (2) ENME 409 Physiological Simulation
- (3) ENME 451 Biomechanics
- (4) MDPH 406 Medical Imaging

*Note: ENME 401 Mechanical Systems Design and ENME 408 Honours Development Project must be taken with an approved biomedical engineering focus as approved by the Director of Studies.*

### Mechatronics Engineering

#### 39. Second Year

- (1) ENEL 198 Electrical Workshop Course
- (2) ENME 199 Workshop Training Course for Mechanical and Mechatronics Engineering
- (3) EMTH 210 Engineering Mathematics 2
- (4) EMTH 211 Engineering Linear Algebra and Statistics
- (5) ENCE 260 Computer Systems

- (6) ENEL 270 Principles of Electronics and Devices
- (7) ENME 202 Stress, Strain and Deformation in Machine Elements
- (8) ENME 203 Dynamics and Vibrations
- (9) ENMT 211 Principles of Mechatronics or ENMT 201 Mechatronics Design
- (10) ENMT 221 Mechatronics Design 1 or ENMT 201 Mechatronics Design

#### 40. Third Year

- (1) ENCE 361 Embedded Systems 1
- (2) ENEL 301 Fundamentals of Engineering Economics and Management
- (3) ENEL 372 Power and Analogue Electronics
- (4) ENME 302 Computational and Applied Mechanical Analysis
- (5) ENME 303 Controls and Vibrations
- (6) ENMT 301 Mechatronics System Design
- (7) Sufficient courses selected from:
  - (a) ENME 215 Engineering Thermodynamics
  - (b) ENME 314 Fluid Mechanics
  - (c) ENEL 373 Digital Electronics and Devices
  - (d) Any 15 point 300-level option to be approved by the Director of Studies

#### 41. Fourth Year

- (1) ENMT 401 Mechatronics Honours Research and Development Project
- (2) ENCE 461 Embedded Systems 2
- (3) ENME 403 Linear Systems Control and System Identification
- (4) Sufficient courses selected from:
  - (a) ENMT 482 Robotics
  - (b) COSC 428 Computer Vision
  - (c) ENCE 464 Embedded Software and Advanced Computing
  - (d) ENEL 471 Power Electronics 2
  - (e) ENME 402 Acoustics and Vibrations
  - (f) ENME 406 Engineering Product Design and Analysis
  - (g) ENME 423 Instrumentation and Sensors
  - (h) Any 15 point 400-level option to be approved by the Director of Studies

#### *Natural Resources Engineering*

#### 42. Second Year

- (1) ENCI 199 Health & Safety on the Worksite
- (2) EMTH 210 Engineering Mathematics 2
- (3) ENCN 201 Communication Skills Portfolio 1
- (4) ENCN 213 Design Studio 1
- (5) ENCN 221 Engineering Materials
- (6) ENCN 231 Solid Mechanics
- (7) ENCN 242 Fluid Mechanics and Hydrology
- (8) ENCN 253 Soil Mechanics
- (9) ENCN 261 Transport and Surveying
- (10) ENCN 281 Environmental Engineering

Note: A student is required to attend the First Professional Examination Camp. Work at the camp will form part of the assessment for ENCN 261 Transport and Surveying.

#### 43. Third Year

- (1) ENCN 375 Sustainable Engineering for a Changing Climate
- (2) ENNR 320 Integrated Catchment Analysis
- (3) ENCN 347 Stormwater Systems Engineering
- (4) ENCN 301 Communication Skills Portfolio 2
- (5) ENCN 304 Deterministic Mathematical Methods
- (6) ENCN 305 Programming, Statistics and Optimization

- (7) ENCN 342 Hydraulics and Applied Hydrology
- (8) ENCN 353 Geotechnical Engineering
- (9) ENCN 371 Project and Infrastructure Management

#### 44. Fourth Year

- (1) ENCN 493 Project
- (2) ENNR 413 Integrated Natural Resources Design
- (3) Sufficient courses selected from:
  - (a) ENNR 405 Ecologically Engineered Designs
  - (b) ENNR 422 Water Resources and Irrigation Engineering
  - (c) ENNR 423 Sustainable Energy Systems
  - (d) ENCN 401 Engineering in Developing Communities
  - (e) ENCN 412 Traffic Engineering
  - (f) ENCN 415 Pavement Engineering
  - (g) ENCN 444 Water Infrastructure Systems Design
  - (h) ENCN 445 Fluid Mechanics of Environmental Systems
  - (i) ENCN 452 Advanced Geotechnical Engineering
  - (j) ENCN 454 Introduction to Geotechnical Earthquake Engineering
  - (k) ENCN 481 Water and Wastewater Treatment Systems
  - (l) ENGR 403 Fire Engineering
  - (m) WATR 403 Water Management, Policy, and Planning
  - (n) Any 15 point 400-level option to be approved by the Director of Studies
  - (o) A student with a GPA of 6 or more may apply to take one 600-level course approved by the Director of Studies

#### Software Engineering

#### 45. Second Year

- (1) SENG 199 Software Engineering Workshop Training Course
- (2) SENG 201 Software Engineering 1
- (3) SENG 202 Software Engineering Project Workshop
- (4) COSC 261 Formal Languages and Compilers
- (5) COSC 262 Algorithms
- (6) COSC 265 Relational Database Systems
- (7) ENCE 260 Computer Systems
- (8) Sufficient courses selected from schedules A and B below. Course selection must include at least one course from Schedule A.

##### Schedule A

- (1) EMTH 210 Engineering Mathematics 2
- (2) MATH 220 Discrete Mathematics and Cryptography

##### Schedule B

- (1) COSC 264 Introduction to Computer Networks and the Internet
- (2) EMTH 211 Engineering Linear Algebra and Statistics
- (3) MATH 230 Logic, Automata, and Computability

#### 46. Third Year

- (1) SENG 301 Software Engineering II
- (2) SENG 302 Software Engineering Group Project
- (3) SENG 365 Web Computing Architectures
- (4) COSC 368 Humans and Computers
- (5) ENEL 301 Fundamentals of Engineering Economics and Management
- (6) Sufficient courses selected from:
  - (a) COSC 362 Network and Data Security
  - (b) COSC 363 Computer Graphics
  - (c) COSC 364 Internet Technology and Engineering

- (d) COSC 367 Computational Intelligence
- (e) DATA 301 Big Data Computing and Systems
- (f) ENCE 360 Operating Systems
- (g) ENCE 361 Embedded Systems 1
- (h) DATA 301 Big Data Computing and Systems
- (i) Any 15 point 300-level option to be approved by the Director of Studies

**47. Fourth Year**

- (1) SENG 401 Software Engineering III
- (2) SENG 402 Software Engineering Research Project
- (3) COSC 424 Secure Software
- (4) Sufficient 400-level courses selected from COSC, SENG, ENCE, and DATA 430–439 approved by the Director of Studies