Programme Title
Artificial Intelligence: Systems and Technologies

Study Scheme

<table>
<thead>
<tr>
<th>Units</th>
<th>Description</th>
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</thead>
</table>
| 9     | 1. Faculty Package:  
|       | • ENGG1110/ESTR1002 Problem Solving By Programming  
|       | • ENGG1120/ESTR1005 Linear Algebra for Engineers  
|       | • ENGG1130/ESTR1006 Multivariable Calculus for Engineers  |
| 16    | 2. Foundation Courses:  
|       | • AIST1110 Introduction to Computing using Python  
|       | • ENGG2440/ESTR2004 Discrete Mathematics for Engineers  
|       | • ENGG2760/ESTR2018 Probability for Engineers (2 units)  
|       | • ENGG2780/ESTR2020 Statistics for Engineers (2 units)  
|       | • MATH1510 Calculus for Engineers  
|       | • PHYS1003 General Physics for Engineers/PHYS1110 Engineering Physics: Mechanics and Thermodynamics  |
| 17    | 3. Required Courses:  
|       | (a) AIST3010 Numerical optimization (2 units)  
|       | • AIST3020 Introduction to Computer Systems  
|       | • CSC12100/ESTR2102 Data Structures  
|       | • CSC13160/ESTR3104 Design and Analysis of Algorithms  
|       | • CSC13230/ESTR3108 Fundamentals of Artificial Intelligence  
|       | • CSC13320 Fundamentals of Machine Learning  
|       | (b) Research Component Courses[a]:  
|       | • AIST4998 Final Year Project I  
|       | • AIST4999 Final Year Project II  
| 6     | (c) Practicum Courses:  
|       | • AIST2601 Technology, Society and Engineering Practice (2 units)  
|       | • AIST2602 Engineering Practicum (1 unit)  |
| 24    | 4. Elective Courses (Choose any ONE from the following five options):  
|       # (a) General Artificial Intelligence: Systems and Technologies  
|       | Choose at least 18 units from the following courses:  
|       | • AIST2010 Introduction to Computer Music  
|       | • AIST3510/SEEM3510 Human-computer Interaction  
|       | • BMEG3103 Big Data in HealthCare  
|       | • CSC13130 Formal Languages and Automata Theory  
|       | • CSC13150/ESTR3102 Introduction to Operating Systems  
|       | • CSC13170 Introduction to Database Systems  
|       | • CSC14130/IERG4130/ESTR4306 Introduction to Cyber Security  
|       | • CSC14160/ESTR4104 Distributed and Parallel Computing  
|       | • CSC14180/ESTR4106 Introduction to Cloud Computing and Storage  
|       | • CSC14230 Computational Learning Theory  
|       | • CSC14430/ESTR4120 Data Communication and Computer Networks/IERG3310 Computer Networks  
|       | • CSC15030 Machine Learning Theory  
|       | • CSC15120 Advanced Topics in Database Systems  
|       | • CSC15150 Machine Learning Algorithms and Applications  
|       | • CSC15240 Combinatorial Search and Optimization with Constraints  
|       | • CSC15350 Advanced Topics in Game Theory  
|       | • CSC15550 Advanced File and Storage Systems  |
CSCI5570 Large Scale Data Processing Systems
CSCI5580 Online Algorithms for Machine Learning and Optimizations
ELEG5491 Introduction to Deep Learning
ENGG1820 Engineering Internship (1 unit)
ENGG5103 Techniques for Data Mining
ENGG5105 Computer and Network Security
ENGG5108 Big Data Analytics
ENGG5501 Foundations of Optimization
FTEC4002 Behavioral Analytics
FTEC4003 Data Mining for FinTech
FTEC4005 Financial Informatics
IERG2051/ESTR2302 Signals and Systems
IERG3050 Simulation and Statistical Analysis
IERG4230 Introduction to Internet of Things
IERG4300/ESTR4300 Web-scale Information Analytics
IERG4330/ESTR4316 Programming Big Data Systems
IERG5130 Probabilistic Models and Inference Algorithms for Machine Learning
MAEG3060/ESTR3408 Introduction to Robotics
MAEG3080 Fundamentals of Machine Intelligence
MAEG5060 Computational Intelligence
SEEM2460/ESTR2540 Introduction to Data Science
SEEM4630 E-Commerce Data Mining
SEEM5330 Speech and Language Processing
SEEM5680 Text Mining Models and Application
STAT4001 Data Mining and Statistical Learning
STAT4005 Time Series

Remaining units can be chosen from any course under item 4(b) – 4(e)

(b) **Stream 1: Biomedical Intelligence**

Required Courses:
BMEG2001/ESTR2201 Introduction to Biomedical Engineering (1 unit)
BMEG3102 Bioinformatics
BMEG3105 Data Analytics for Personalized Genomics and Precision Medicine

Elective Courses (Choose at least 12 units from the following):
BMEG2300/ESTR2601 Circuits and Signals for Biomedical Engineering
BMEG3101/ESTR3601 Medical Instrumentation and Design
BMEG3103 Big Data in HealthCare
BMEG3130 Tele-medicine and Mobile Healthcare
BMEG3320 Biomedical Imaging
BMEG3420 Medical Robotics
BMEG3910 Undergraduate Research in Biomedical Engineering
BMEG4010/ESTR4601 Global Medical Device Regulatory Affairs
BMEG4103 Biomedical Modelling
BMEG4320/ESTR4200 Biomedical Imaging Applications
BMEG4510/ESTR4204 Biomolecular Engineering
MAEG3060/ESTR3408 Introduction to Robotics

Remaining units can be chosen from any course under item 4(a) General Artificial Intelligence: Systems and Technologies

(c) **Stream 2: Intelligent Multimedia Processing**

Required Courses (6 units):
CSCI3280 Introduction to Multimedia Systems
IERG2051/ESTR2302 Signals and Systems

Elective Courses (Choose at least 12 units from the following):
AIST2010 Introduction to Computer Music
AIST3510/SEEM3510 Human-computer Interaction
CSCI3260 Principles of Computer Graphics
ELEG3503 Introduction to Digital Signal Processing
ELEG4511/ESTR4218 Digital Signal Processing and Applications
ELEG4512 Digital Image Processing / IERG4160/ESTR4104 Image and Video Processing
ELEG5491 Introduction to Deep Learning
ENGG5202 Pattern Recognition
IERG3320/ESTR3306 Social Media and Human Information Interaction
IERG4190 Multimedia Coding and Processing
IERG4300/ESTR4300 Web-scale Information Analytics
IERG5130 Probabilistic Models and Inference Algorithms for Machine Learning
LING2003 Phonetics I / LING2004 Phonology I
LING2005 Syntax I
LING2006 Semantics
LING4201 Neurolinguistics
SEEM5680 Text Mining Models and Application

Remaining units can be chosen from any course under item 4(a) General Artificial Intelligence: Systems and Technologies

(d) Stream 3: Large-scale Artificial Intelligence - Theory and Systems

Required Courses (3 units):
CSCI3150/ESTR3102 Introduction to Operating Systems

Elective Courses (Choose at least 15 units from the following):
CSCI13170 Introduction to Database Systems
CSCI14160/ESTR4104 Distributed and Parallel Computing
CSCI14180/ESTR4106 Introduction to Cloud Computing and Storage
CSCI4230 Computational Learning Theory
CSCI5030 Machine Learning Theory
CSCI5120 Advanced Topics in Database Systems
CSCI5150 Machine Learning Algorithms and Applications
CSCI5240 Combinatorial Search and Optimization with Constraints
CSCI5350 Advanced Topics in Game Theory
CSCI5550 Advanced File and Storage Systems
CSCI5570 Large Scale Data Processing Systems
CSCI5580 Online Algorithms for Machine Learning and Optimizations
ENGG5103 Techniques for Data Mining
ENGG5108 Big Data Analytics
IERG3050 Simulation and Statistical Analysis
IERG4080/ESTR4312 Building Scalable Internet-based Services
IERG4230 Introduction to Internet of Things
IERG4300/ESTR4300 Web-scale Information Analytics
IERG4330/ESTR4316 Programming Big Data Systems
IERG5130 Probabilistic Models and Inference Algorithms for Machine Learning
STAT4001 Data Mining and Statistical Learning
STAT4005 Time Series

Remaining units can be chosen from any course under item 4(a) General Artificial Intelligence: Systems and Technologies

(e) Stream 4: Intelligent Manufacturing and Robotics

Required Courses (8 units):
MAEG2020/ESTR2400 Engineering Mechanics
ENGG2720/ESTR2014 Complex Variables for Engineers
MAEG3040 Mechanical Design

Elective Courses (Choose at least 9 units from the following):
MAEG3020/ESTR3404 Manufacturing Technology
MAEG3060/ESTR3408 Introduction to Robotics
MAEG3050/ESTR3406 Introduction to Control Systems
EEEN2040 Building Service Engineering and Green Building
EEEN3010/ESTR3410 Building Automation and Control
MAEG3080 Fundamentals of Machine Intelligence
MAEG4010/ESTR4408 Computer-integrated Manufacturing
MAEG4020/ESTR4410 Finite Element Modelling and Analysis
MAEG4050 Modern Control Systems Analysis and Design
MAEG5060 Computational Intelligence
MAEG5080 Topics in Robotics
SEEM3500 Quality Control and Management
In addition to fulfilling the above Major Programme Requirement, students may also challenge themselves by taking the following stream offered by the Faculty:

**Engineering Leadership, Innovation, Technology and Entrepreneurship (ELITE) Stream**

Elective Courses:
15 units of courses[c]:

i) 12 units of ESTR courses of which at most 6 units of courses at 1000 or 2000 level and at least 6 units of courses at 3000 or 4000 level[d]

ii) 3 units of BMEG/CENG/CSCI/ELEG/ENGG/IERG/MAEG/SEEM courses at 5000 level[e]

Explanatory Notes:
1. Students who have fulfilled the Major Programme Requirements of their respective Engineering programmes (or equivalent courses as approved by the Sub-Committee on Education Technologies) will be eligible to apply for exemption of 1 unit of University Core IT Requirement. Students are required to apply for the exemption. When exemption from a particular course is recognized, students can only be exempted from the course but not the units. Please follow the application procedures as announced by the IT Foundation Course Office at https://engg1000.cse.cuhk.edu.hk.

2. All courses at 2000 and above level listed in the Major Programme Requirement will be included in the calculation of Major GPA for honours classification, excluding courses in Faculty Package and Foundation Courses.

3. Students are not allowed to declare Minor in Data Analytics and Informatics.

[a] Students who have declared to specialize in the ELITE Stream will be required to complete 6 units of ESTR4998 and 4999 to substitute for AIST4998 and 4999.

[b] Details of the entrance and coursework requirements, and declaration procedures for the ELITE Stream can be found at the ELITE website (www.erg.cuhk.edu.hk/elite). Non-ELITE Engineering students may be allowed to take ESTR courses. Students are required to seek approval from their respective Major Programmes for using ESTR courses taken to fulfill the Major Programme Requirement. Details are available at the ELITE website.

[c] Students can use up to 9 units of courses which have been taken to fulfill the requirements of items 1 to 4 above to fulfill the elective requirements of the ELITE Stream. Item 3(b) Research Component Courses will not be included in these 9 units. A full list of ESTR courses is available at the ELITE website.

[d] Students can use BMEG/CENG/CSCI/ELEG/ENGG/IERG/MAEG/SEEM courses at 5000 level to substitute for ESTR courses at 3000 or 4000 level, subject to the approval of the Stream Director and the Associate Dean (Education).

[e] The requirement of at least 3 units of Engineering courses at 5000 level is a requirement for the ELITE Stream only. It should not be interpreted as a requirement of the Major Programme.
(Recommended Course Pattern)

Recommended Course Pattern

1. A student shall take at least 9 units and no more than 18 units of courses in any term within the normative study period. A student shall take no more than 6 units of courses in each summer session, and no student shall be allowed to take more than 39 units in an academic year.

2. Sufficient units should be allowed in each term for students to fulfill the University Core Requirements, which include: (i) 6 units of Chinese; (ii) 9 units of English; (iii) 1 unit of IT; (iv) 21 units of General Education; and (v) 2 units of Physical Education.

3. Programmes with different streams/concentrations are required to provide the recommended pattern for each stream/concentration.

Major Programme Requirement of Artificial Intelligence: Systems and Technologies

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<thead>
<tr>
<th>Year of Attendance</th>
<th>Recommended Course Pattern</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>First Year of Attendance</td>
<td>1st term</td>
<td>Faculty Package: ENGG1110/ESTR1002</td>
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<tr>
<td></td>
<td></td>
<td>Major Required: MATH1510, PHYS1003/1110</td>
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<tr>
<td></td>
<td>2nd term</td>
<td>Faculty Package: ENGG1120/ESTR1005, ENGG1130/ESTR1006</td>
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<tr>
<td></td>
<td></td>
<td>Major Required: AIST2601, AIST2602</td>
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<tr>
<td>Second Year of Attendance</td>
<td>1st term</td>
<td>Major Required: AIST1110, ENGG2440/ESTR2004, ENGG2760/ESTR2018</td>
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<tr>
<td></td>
<td>2nd term</td>
<td>Major Required: AIST3020, ENGG2780/ESTR2020, CSCI2100/ESTR2102</td>
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<tr>
<td>Third Year of Attendance</td>
<td>1st term</td>
<td>Major Required: AIST3010, CSCI3160/ESTR3104, CSCI3230/ESTR3108</td>
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<tr>
<td></td>
<td></td>
<td>Major Elective(s): 3-6 units from stream required courses /major electives</td>
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<tr>
<td></td>
<td>2nd term</td>
<td>Major Required: CSCI3320</td>
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<tr>
<td></td>
<td></td>
<td>Major Elective(s): 9-12 units from stream required courses / major electives</td>
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<tr>
<td>Fourth Year of Attendance</td>
<td>1st term</td>
<td>Major Required: AIST4998</td>
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<tr>
<td></td>
<td></td>
<td>Major Elective(s): 6-9 units from stream required courses / major electives</td>
</tr>
<tr>
<td></td>
<td>2nd term</td>
<td>Major Required: AIST4999</td>
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<tr>
<td></td>
<td></td>
<td>Major Elective(s): 6-9 units from stream required courses / major electives</td>
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<tr>
<td></td>
<td>Total (including Faculty Package):</td>
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