Applicable to 42477–1 Students (2019/20 Intake Cohort and onwards of normal year 1 entry)

The Hong Kong Polytechnic University
Department of Electronic and Information Engineering

Minor Changes to the BSc (Hons) in Internet and Multimedia Technologies (BSc in IMT) (42477) Programme

Background

The Department reviews the programme regularly to ensure the subjects of the curriculum match with the education background and needs of the students, align with the programme aims, objectives and intended learning outcomes, cater to the demand for talents from the industries, and stay abreast of the development of the technology. To align with the development trend of many electronic and information engineering as well as computer science academic programmes around the world where training on Artificial Intelligence (AI) is introduced into the curricula, the Department has proposed a number of relevant minor changes to the BSc (Hons) in Internet and Multimedia Technologies (BSc in IMT) (42477) programme.

1. Removing "EIE2106 Signal and System Analysis" from and Adding a New Subject "EIE2108 Fundamentals of Internet and Multimedia Technologies" to the 4-year Curriculum

The first change is to remove the existing Level 2 compulsory subject, "EIE2106 Signal and System Analysis" from the 4-year curriculum and add a new compulsory subject, "EIE2108 Fundamentals of Internet and Multimedia Technologies" (Appendix I), to the 4-year curriculum as a replacement.

Currently, "EIE2106 Signal and System Analysis" is a 3-credit compulsory subject for the 4-year BSc in IMT curriculum. It aims at providing students with basic concepts in signal acquisition and analysis techniques, and an analytical foundation for further studies in Communication Engineering and Digital Signal Processing.

Since the main objective of the revisions to the BSc in IMT programme is to shape it to become a more AI-focused programme, it will be more beneficial to students' learning of more advanced topics in AI if a subject can equip students with the fundamental knowledge of calculus and linear algebra, which could serve as the foundations for learning the fundamentals of AI and Signal Processing (such as discrete Fourier transform, sampling theorem). Hence, the Department has modified the content of EIE2106 so as to provide students with an understanding of how calculus and linear algebra can be applied to AI and Signal Processing. As the subject content of EIE2106 will be substantially revised, a new subject titled "EIE2108 Fundamentals of Internet and Multimedia Technologies" will replace the old subject EIE2106. Students admitted to the programme through the normal year 1 entry are expected to take EIE2108 in Year 2 Semester 1.

Such change will take effect from 2020/21 Semester 1 and be applicable to 2019/20 intake cohort of the normal year 1 entry and beyond.

2. Adding "EIE3124 Fundamentals of Machine Intelligence" to the 4-year Curriculum as a Compulsory Subject

With an aim to shape the BSc in IMT programme to become a more AI-focused programme, it would be helpful to students' learning of more advanced topics in AI if a subject could equip students with the fundamental knowledge of statistics and their application to AI and machine learning. A new 3-credit compulsory subject titled "EIE3124 Fundamentals of Machine Intelligence" is therefore added to the 4-year curriculum. Students admitted to the programme through the normal year 1 entry are expected to take EIE3124 in Year 2 Semester 2. The syllabus of EIE3124 can be found in Appendix II of the attachment.

Such change will take effect from 2020/21 Semester 2 and be applicable to 2019/20 intake cohort of the normal year 1 entry and beyond.

3. Changing "EIE4431 Digital Video Production and Broadcasting" and "EIE4435 Image and Audio Processing" from Compulsory Subjects to Elective Subjects, and Increasing the Number of Technical Electives Required from 3 to 4

To provide greater flexibility to the BSc in IMT students in choosing the subjects that match with their interests and career aspirations, the number of technical electives required for graduation increases from 3 to 4 to enable students to select one more technical elective of their choice.

In order to keep the total number of credits required for graduation unchanged after increasing the number of technical electives required, as well as to provide sufficient number of technical electives for students' selection, "EIE4431 Digital Video Production and Broadcasting" and "EIE4435 Image and Audio Processing" are changed from compulsory subjects to elective subjects.

Under the revised BSc in IMT curriculum, the electives are categorized into two streams of study: Technology Stream and Science Stream. The Technology Stream is about multimedia and networking technologies which is more engineering-oriented emphasizing practical implementation. The Science Stream is about machine intelligence for IMT which is more on scientific exploration. For specializing in a stream of study, students have to complete 4 out of 5 subjects of that stream. Students can, however, choose to take any 4 technical electives of both streams if they do not want to specialize in a particular stream of study. Both EIE4435 and EIE4431 fall into the Technology stream of study.

Such change will take effect from 2021/22 Semester 1 and be applicable to 2019/20 intake cohort of the normal year 1 entry and beyond.

4. Adding a New Elective Subject "EIE4122 Deep Learning and Deep Neural Networks" to the 4-year and Senior Year Curricula as Elective Subject

To enable students to break into the cutting-edge AI field and to master essential knowledge of deep learning, the Department therefore introduces the new 3-credit subject "EIE4122 Deep Learning and Deep Neural Networks" to the BSc in IMT programme as a technical elective subject in the Science stream of study.

EIE4122 is planned to equip students with an understanding of the major technology trends driving Deep Learning and the key parameters in a neural network's architecture. It also aims at enabling students to understand how to implement efficient neural networks and training students to be able to apply connected deep neural networks. The syllabus of EIE4122 can be found in Appendix III of the attachment.

Such change will take effect from 2021/22 and be applicable to 2019/20 intake cohort of the normal year 1 entry and beyond.

A summary of the above minor changes to the BSc in IMT programme curriculum can be found in Table 1 below. The revised specified progression pattern resultant from the minor changes can be found in Appendix IV.

Table 1: Minor Changes to the BSc in IMT Programme

	Subject/Requirement	**Before Revision**	**After Revision**	**Effective Year; Applicable Intake Cohort**
1	EIE2106 Signal and System Analysis	Compulsory subject for 4-year curriculum	Removed from the 4-year curriculum	2020/21 Sem 1; 2019/20 intake cohort of normal year 1 entry and onwards
	EIE2108 Fundamentals of Internet and Multimedia Technologies	N/A	Added to the curriculum as compulsory subject for 4-year curriculum	
2	EIE3124 Fundamentals of Machine Intelligence	N/A	Added to the curriculum as compulsory subject for 4-year curriculum	2020/21 Sem 2; 2019/20 intake cohort of normal year 1 entry and onwards
3	EIE4431 Digital Video Production and Broadcasting	Compulsory subject for 4-year and senior year curricula	Elective subject for 4-year and senior year curricula	2021/22 Sem 1; 2019/20 intake cohort of normal year 1 entry and beyond, and 2021/22 intake cohort of senior year entry and beyond
	EIE4435 Image and Audio Processing	Compulsory subject for 4-year and senior year curricula	Elective subject for 4-year and senior year curricula	
	Number of technical electives required	3	4	
	Electives are categorized into two streams of study	N/A	Technology Stream an Science Stream	
4	EIE4122 Deep Learning and Deep Neural Networks	N/A	Added to the 4-year and senior year curricula as elective subject	2021/22; 2019/20 intake cohort of normal year 1 entry and

	Subject/Requirement	Before Revision	After Revision	Effective Year; Applicable Intake Cohort
				beyond, and 2021/22 intake cohort of senior year entry and beyond

Appendix I

Subject Description Form

Subject Code	EIE2108
Subject Title	Fundamentals of Internet and Multimedia Technologies
Credit Value	3
Level	2
Pre-requisite	Nil
Co-requisite/ Exclusion	Nil
Objectives	1. To introduce the latest development of Internet and Multimedia Technologies (IMT) and their relationship with the society development. 2. To introduce the common mathematical and programming tools used in the study of IMT.
Intended Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. understand the latest development of IMT; 2. understand the common mathematical tools used in the study of IMT; 3. apply computer programming techniques to solve practical scientific problems; and Category B: Attributes for all-roundedness 4. solve problems independently.
Subject Synopsis/ Indicative Syllabus	1. Introduction to IMT a) Digital transformation of the multimedia industry b) Digital right management. Digital Entertainment Content Ecosystem (DECE) c) Overview of modern multimedia technologies: Audio, image, video, streaming, virtual reality / augmented reality, gaming, artificial intelligence 2. Mathematical Foundations of IMT a) Calculus: Review of differentiation and integration. Partial derivatives, chain rule, maxima and minima. Case study: Solving optimization problem in IMT using differentiation b) Signals and systems: Review of radian representation of angles. Complex number, the Euler theorem, time and frequency, Fourier transform, digital systems, concept of sampling theorem, discrete Fourier transform. Case study: Real life application in IMT using the discrete Fourier transform c) Linear algebra: Review of basic matrix operations. Determinants and systems of linear equations. Eigenvalues and eigenvectors. Case study: Real life application in IMT using linear algebra. 3. Scientific programming for IMT a) Python programming for scientific problems b) Introduction of Python specialized modules for numerical computation (e.g. Numpy, Scipy, Matplotlib, etc.)

Teaching/Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures / Tutorials	1,2,3	Fundamental principles and key concepts of the subject are delivered to students. Tutorials are also conducted at the end of the lectures to allow the students to have a deeper understanding of the lecture materials.
Presentation sessions	1	Students will present in groups of their finding on the latest development of internet and multimedia technologies.
Laboratory sessions	2,3,4	Students will experience the applications of different mathematical tools by means of some computer programming experiments in numerical computation.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		1	2	3	4
1. Continuous Assessment (50%)					
• Test	18%		✓	✓	✓
• Short quizzes and assignments	7%		✓	✓	
• Laboratory sessions	18%		✓	✓	✓
• Presentation	7%	✓			
2. Examination	50%		✓	✓	✓
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Short quizzes and assignments	They can measure the students' understanding of the theories and concepts as well as their comprehension of subject materials.
Test and examination	End-of-chapter-type problems are used to evaluate the students' understanding of subject materials and the ability in applying concepts and skills learned in the classroom. Students need to think critically and to learn independently in order to come up with an alternative solution to an existing problem. They need to present their solutions logically and systematically in the test and the examination.
Laboratory sessions	Students are required to make a demonstration of their solutions on a selected open-ended question in each laboratory session for evaluating their problem-solving skill. Students also need to submit lab reports for evaluating their overall performance in the laboratory sessions.
Presentation	Students are required to present in groups of their finding on the latest development of internet and multimedia technologies.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture / Tutorial	26 Hours
	• Laboratory/Presentation Classes	13 hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Laboratory/Presentation Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**

Reading List and References

References:

1. S. Banerjee, *Elements of Multimedia*, Chapman and Hall/CRC. 2019.
2. O.K. Lanham, *Para-interactivity and the Appeal of Television in the Digital Age*, Lexington Books, 2017.
3. M.J. Roberts, *Fundamentals of Signals & Systems*, McGraw-Hill, 2008.
4. R. Larson, Edwards, B. *Single Variable Calculus*, Brooks/Cole 2012
5. R. Larson, *Elementary Linear Algebra*, Brooks/Cole 2013
6. J.M. Stewart, *Python for Scientists*, Cambridge University Press 2014.

Last Updated	December 2019
Prepared by	Dr Daniel Lun

Subject Description Form

Subject Code	EIE3124
Subject Title	Fundamentals of Machine Intelligence
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To introduce basic knowledge about various algorithms that forms the foundation of machine intelligence. 2. To develop practical knowledge about machine intelligence.
Intended Subject Learning Outcomes	Upon completion of the subject, students will be able to: Category A: Professional/academic knowledge and skills 1. Understand the foundation knowledge about machine intelligence 2. Apply different techniques of machine intelligence to solve problems Category B: Attributes for all-roundedness 3. Presents ideas and findings effectively
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction to machine intelligence Ideas of machine intelligence; Use of statistics in various phases of machine intelligence including data preparation, model selection, model evaluation, model presentation and prediction. 2. Use of statistics in machine intelligence Descriptive statistics; inferential statistics; Important findings in statistics for machine intelligence such as the Law of Large Numbers and Central Limit Theorem. 3. Parametric estimation Introduction to parametric estimation; classical parametric estimation such as Bayes Theorem, hypothesis testing and significance tests; Application examples of parametric estimation in machine intelligence including data pre-processing, parametric identification, model generation, validation and selection criteria. 4. Linear approaches Introduction to basic ideas of linear approaches for regression in machine intelligence; Introduction to techniques such as univariate linear model, least-squares estimation and maximum likelihood estimation. Application examples of linear regression techniques. 5. Nonlinear approaches Introduction to basic ideas of nonlinear approaches for regression in machine intelligence; Introduction to techniques such as artificial neural networks and radial basis functions. Application examples of nonlinear approaches for regression. Laboratory experiments: 1. Lab 1: Use of statistics in machine intelligence 2. Lab 2: Parametric estimation 3. Lab 3: Linear approaches for regression in machine intelligence

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials	1, 2	Supplementary to lectures: Students will be able to clarify concepts and to have a deeper understanding of the lecture materials; Problems and applications are given and discussed.
Laboratory sessions	2, 3	Students will evaluate different methods of machine intelligence.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/ Task	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)		
		1	2	3
1. Continuous Assessment (total 40%)				
• Tests	18%	√	√	
• Short quizzes	10%	√		
• Laboratory sessions	12%		√	√
2. Examination	60%	√	√	
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Short quizzes and assignments	They can measure the students' understanding of the theories and concepts as well as their comprehension of subject materials.
Tests and examination	End-of-chapter-type problems are used to evaluate the students' ability in applying concepts and skills learned in the classroom; Students need to think critically and to learn independently in order to come up with an alternative solution to an existing problem. They need to present their solutions logically and systematically in the tests and the examination.
Laboratory sessions	Oral examination based on laboratory exercises will be conducted to evaluate student's technical knowledge and communication skills.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	1. Jose Unpingco, Python for Probability, Statistics, and Machine Learning, second edition, Springer, 2019. 2. Steven W. Knox and Hoboken NJ, Machine learning: a concise introduction, Wiley 2018. 3. James D. Miller, Statistics for Data Science: leverage the power of statistics for data analysis, classification, regression, machine learning, and neural networks, Packt Publishing, 2017. 4. Pratap Dangeti, Statistics for machine learning: build supervised, unsupervised, and reinforcement learning models using both Python and R, Packt Publishing, 2017. 5. Machine Learning: a Probabilistic Perspective by Kevin Murphy, MIT Press, 2012.	
Last Updated	Oct 2019	
Prepared by	Dr Bonnie Law	

Subject Description Form

Subject Code	EIE4122
Subject Title	Deep Learning and Deep Neural Networks
Credit Value	3
Level	4
Pre-requisite	**For 42477:** EIE3124: Fundamentals of Machine Intelligence **For 42470:** AMA2104 Probability and Engineering Statistics
Co-requisite/ Exclusion	Nil
Objectives	This course is for students who would like to equip themselves with cutting edge AI knowledge and knowhow that facilitate them to join the AI profession. Students will learn the foundations of deep learning and understand how to construct deep neural networks for real-world applications and AI systems. Students will also learn the major trends in deep learning and deep neural networks.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the benefits of deep learning and deep neural networks. 2. Understand the basic theories in deep learning and adversarial learning. 3. Understand how deep learning and deep neural networks are applied in real-world applications and AI systems. Category B: Attributes for all-roundedness 4. Understand the creative process when designing solutions to a problem.
Subject Synopsis/ Indicative Syllabus	1. A High-Level Perspective of Deep Learning and Deep Neural Networks 1.1 What are neural networks and deep neural networks? 1.2 Relationship among AI, machine learning, deep learning, and DNNs 1.3 Neural networks: From shallow to deep 1.4 How DNNs learn from data? 1.5 Examples of real-life applications 1.6 Pipeline and tools for building AI systems 2. Neural Networks and Deep Neural Networks 2.1 Vectors, matrices, tensors; vector space. 2.2 Perceptrons and multi-layer perceptrons 2.3 Geometric interpretation 2.4 Non-linear activation functions and their roles 2.5 Neural networks for classification and regression 2.6 Autoencoder 2.7 Attention mechanism 3. Deep Learning 3.1 Basic loss functions: MSE and cross-entropy (softmax) loss 3.2 Advanced loss functions: triplet, center, angular, and large-margin softmax loss 3.3 Gradient-based optimization: SGD, AdaGrad, RMSProp, Adam 3.4 Backpropagation 3.5 Weight initialization: pre-training and Xavier 3.6 Batch normalization 3.7 Regularization: Dropout, weight decay, L1 and L2, data augmentation, and early stopping 3.8 Internal representation

<table>
<tr><td></td><td>
3.9 representation learning

4. Convolutional Neural Networks (CNNs)
4.1 Structure of CNNs
4.2 Why convolution
4.3 Internal representation of CNNs
4.4 Applications of CNNs: object recognition, speech recognition, ECG classification, etc.
4.5 Interpretability and visualization of CNNs
4.6 Time-delay neural networks

5. Recurrent Neural Networks (RNNs)
5.1 Structure of RNNs
5.2 Purpose of recurrent connections
5.3 Long-short term memory (LSTM)
5.4 Gated recurrent unit (GRU)
5.5 Applications of RNNs: machine translation, sentiment analysis, etc.
5.6 Attention in RNN

6. Applications of Deep Learning
6.1 Healthcare
6.2 Finance
6.3 Computer vision
6.4 Natural Language Processing
6.5 Marketing and advertising
6.6 Self-driving cars

7. Software and Hardware Tools
7.1 Software stack: CUDA, cuDNN, Tensorflow, PyTorch, and Keras
7.2 Cloud platforms: Amazon EC2 P3, Azure, Google Cloud, Nvidia GPU cloud, Alibaba Cloud, etc.
7.3 Hardware: GPU, TPU, Nvidia Jetson
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<tr><td>Teaching/Learning Methodology</td><td>
Lectures: The subject matters will be delivered through lectures. Students will be engaged in the lectures through Q&A, discussions and specially designed classroom activities. The background theories on DL and DNNs will be accompanied by various real-applications.

Tutorials: During tutorials, students will work on/discuss some chosen topics. This will help strengthen the knowledge taught in lectures.

Laboratory and assignments: During laboratory exercises, students will perform hands-on tasks to practice what they have learned. They will evaluate performance of systems and design solutions to problems. The assignments will help students to review the knowledge taught in class.

While lectures and tutorials will help to achieve the professional outcomes, the open-ended questions in laboratory exercises and assignments will provide the chance for students to exercise their creatively in problem solving.
</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Subject Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/Tasks</th><th rowspan="2">% Weighting</th><th colspan="4">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1. Continuous Assessment (total: 50%)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>• Homework and assignments</td><td>15%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>• Tests and Quizzes</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>• Laboratory exercises</td><td>15%</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>2. Examination</td><td>50%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="4"></td></tr>
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<tr><td></td><td colspan="2">Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Assignment, homework and laboratory exercises will require students to apply what they have learnt to solve problems. There will be open-ended questions that allow students to exercise their creativity in making design.

Examination and tests: They assess students' achievement of the learning outcomes in a more formal manner.</td></tr>
<tr><td rowspan="7">Student Study Effort Expected</td><td>Class contact (time-tabled):</td><td></td></tr>
<tr><td>• Lecture</td><td>24 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes</td><td>15 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination</td><td>36 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing</td><td>30 Hours</td></tr>
<tr><td>Total student study effort:</td><td>105 Hours</td></tr>
<tr><td>Reading List and References</td><td colspan="2">Reference Materials:

1. I. Goodfellow, Y. Bengio and A. Courville, Deep Learning, MIT Press 2016
2. M.W. Mak and J.T. Chien, Machine Learning for Speaker Recognition, Cambridge University Press, 2020.
3. C.M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
4. J. Langr and V. Bok, GANs in Action: Deep Learning with Generative Adversarial Networks (GANs), Manning Publications, 2018.
5. F. Chollet, Deep Learning with Python, Manning Publications, 2018.</td></tr>
<tr><td>Last Updated</td><td colspan="2">August 2019</td></tr>
<tr><td>Prepared by</td><td colspan="2">Dr M.W. Mak</td></tr>
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Specified Progression Pattern for the BSc in IMT (42477) Programme

- Normal Year 1 Intake (for 2019/20 intake and onwards):

Year 1	
Semester 1 (12 credits)	**Semester 2 (18 credits)**
AMA1110 Basic Mathematics I – Calculus and Probability & Statistics (3 credits)	AMA1120 Basic Mathematics II –Calculus and Linear algebra (3 credits)
ENG2003 Information Technology (3 credits)	CAR I (3 credits) Note 1
LCR I – English (3 credits)	CAR II (3 credits) Note 1
ENG1003 Freshman Seminar for Engineering (3 credits)	LCR II – English (3 credits)
	~~EIE1002 Electronics Science~~ EIE1003 Foundations of Data Science (3 credits)
	Leadership and Intra-Personal Development (3 credits)
Healthy Lifestyle (0 credit) Note 1	
Semester 3 – IC2140 Practical Training (5 training credits)	
Year 2	
Semester 1 (15 credits)	**Semester 2 (14 credits)**
LCR III – Chinese (3 credits)	ELC3521 Professional Communication in English (2 credits)
~~EIE2106 Signal and System Analysis~~ EIE2108 Fundamentals of Internet and Multimedia Technologies (3 credits)	~~EIE3103 Digital Signals and Systems~~ EIE3124 Fundamentals of Machine Intelligence (3 credits)
EIE2105 Digital and Computer Systems (3 credits)	EIE3343 Computer Systems Principles (3 credits)
SD2983 Design Communication and Principles (3 credits)	SD2984 3D Graphics and Animation Fundamentals (3 credits)
ENG2002 Computer Programming (3 credits)	EIE3112 Database System (3 credits)
Year 3	
Semester 1 (15 credits)	**Semester 2 (~~18~~ 15 credits)**
EIE3109 Mobile Systems and Application Development (3 credits)	~~EIE4102 IP Networks (3 credits)~~
EIE3320 Object-Oriented Design and Programming (3 credits)	~~EIE4431 Digital Video Production and Broadcasting/~~ Technical Elective 1 (3 credits) Note 2
~~EIE3333 Data and Computer Communications (3 credits)~~ EIE3101 Computer Animation (3 credits)	SD3985 Computer Game Development (3 credits)
EIE3103 Digital Signals and Systems (3 credits)	EIE3360 Integrated Project (3 credits)
EIE4432 Web Systems and Technologies (3 credits)	Service-Learning (3 credits) Note 1
~~EIE4435 Image and Audio Processing (3 credits)~~	~~EIE3101 Computer Animation (3 credits)~~ EIE3333 Data and Computer Communications (3 credits)
Year 4	
Semester 1 (~~15~~ 18 credits)	**Semester 2 (17 credits)**
SD4981 Computer Game Development Project / EIE4430 Honours Project (6 credits)	
EIE4102 IP Networks (3 credits)	AF3625 Engineering Economics (3 credits)
ENG3003 Engineering Management (3 credits)	CBS3241P Professional Communication in Chinese (2 credits)
Technical Elective 2 (3 credits) Note 2	COMP3512 Legal Aspects, Professionalism and Ethics of Computing (3 credits)
Technical Elective 3 (3 credits) Note 2	Technical Elective 4 (3 credits) Note 2
CAR III (3 credits) Note 1	CAR IV (3 credits) Note 1
	~~EIE4431 Digital Video Production and Broadcasting/Technical Elective 3 (3 credits)~~ ~~Note 2~~

Total Number of Credits: 124

Note 1. The study pattern for the subjects is indicative only. Students may take these subjects according to their own schedule. They are recommended to consult their Academic Advisor for guidance and planning if necessary.

Note 2. ~~Students can either take:~~
~~- "EIE4431 Digital Video Production and Broadcasting" in Year 3 Semester 2, Technical Elective 1 and 2 in Year 4 Semester 1 and Technical Elective 3 in Year 4 Semester 2, OR~~
~~- Technical Elective 1 in Year 3 Semester 2, Technical Elective 2 and 3 in Year 4 Semester 1 and "EIE4431 Digital Video Production and Broadcasting" in Year 4 Semester 2.~~

Technology stream electives:
EIE4104 Mobile Networking
EIE4106 Network Management and Security
EIE4428 Multimedia Communications
EIE4431 Digital Video Production and Broadcasting
EIE4435 Image and Audio Processing

Science stream electives:
COMP4434 Big Data Analytics
EIE4100 Computer Vision and Pattern Recognition
EIE4105 Multimodal Human Computer Interaction Technology
EIE4108 Distributed Systems and Cloud Computing
EIE4121 Machine Learning for Cyber-security
EIE4122 Deep Learning and Deep Neural Networks

Programme Specified Subjects for the BSc in IMT (42477) Programme

Table: Compulsory and Elective Subjects to be Taken by BSc in IMT Students

Subject	Subject Title	Credit	Category	
			Normal Year 1 Intake	Senior Year Intake
General University Requirements (GUR)				
-	Cluster-Area Requirement I (CAR I)	3	COM	COM
-	Cluster-Area Requirement II (CAR II)	3	COM	COM
-	Cluster-Area Requirement III (CAR III)	3	COM	-
-	Cluster-Area Requirement IV (CAR IV)	3	COM	-
-	Language and Communication Requirement I (LCR I) – English *	3	COM	-
-	Language and Communication Requirement II (LCR II) – English *	3	COM	-
-	Language and Communication Requirement III (LCR III) – Chinese*	3	COM	-
-	Leadership and Intra-Personal Development	3	COM	-
-	Service-Learning	3	COM	COM
ENG1003	Freshman Seminar for Engineering	3	COM	-
-	Healthy Lifestyle	0	COM	-
Discipline-Specific Requirement (DSR)				
AF3625	Engineering Economics	3	COM	COM
AMA1110	Basic Mathematics I – Calculus and Probability & Statistics	3	COM	-
AMA1120	Basic Mathematics II –Calculus and Linear algebra	3	COM	-
CBS3241P	Professional Communication in Chinese	2	COM	COM
COMP3512	Legal Aspects, Professionalism and Ethics of Computing	3	COM	COM
~~COMP4342~~	~~Mobile Computing~~	~~3~~	~~ELE~~	~~ELE~~
~~COMP4422~~	~~Computer Graphics~~	~~3~~	~~ELE~~	~~ELE~~
COMP4434	Big Data Analytics	3	ELE	ELE
~~EIE1002~~ EIE1003	~~Electronics Science~~ Foundations of Data Science	3	COM	-
EIE2105	Digital and Computer Systems	3	COM	-
~~EIE2106~~ EIE2108	~~Signal and System Analysis~~ Fundamentals of Internet and Multimedia Technologies	3	COM	COM Note 1
ENG2002	Computer Programming	3	COM	-
EIE3101	Computer Animation	3	COM	COM
EIE3103	Digital Signals and Systems	3	COM	COM
EIE3109	Mobile Systems and Application Development	3	COM	COM
EIE3112	Database System	3	COM	-
EIE3124	Fundamentals of Machine Intelligence	3	COM	COM Note 2
EIE3320	Object-Oriented Design and Programming	3	COM	COM
EIE3333	Data and Computer Communications	3	COM	COM
EIE3343	Computer Systems Principles	3	COM	-
EIE3360	Integrated Project	3	COM	COM
EIE4100	Computer Vision and Pattern Recognition	3	ELE	ELE
EIE4102	IP Networks	3	COM	COM
EIE4103	Mobile Computer System Architecture	3	ELE	ELE
EIE4104	Mobile Networking	3	ELE	ELE

Subject	Subject Title	Credit	Category	
			Normal Year 1 Intake	Senior Year Intake
EIE4105	Multimodal Human Computer Interaction Technology	3	ELE	ELE
EIE4106	Network Management and Security	3	ELE	ELE
EIE4108	Distributed Systems and Cloud Computing	3	ELE	ELE
EIE4121	Machine Learning for Cyber-security	3	ELE	ELE
EIE4122	Deep Neural Networks	3	ELE	ELE
EIE4428	Multimedia Communications	3	ELE	ELE
EIE4430	Honours Project	6	COM (Select any 1 subject out of these 2 subjects)	COM (Select any 1 subject out of these 2 subjects)
SD4981	Computer Game Development Project	6		
EIE4431	Digital Video Production and Broadcasting	3	~~COM~~ ELE	~~COM~~ ELE
EIE4432	Web Systems and Technologies	3	COM	COM
EIE4435	Image and Audio Processing	3	~~COM~~ ELE	~~COM~~ ELE
ELC3521	Professional Communication in English	2	COM	COM
ENG2003	Information Technology	3	COM	-
ENG3003	Engineering Management	3	COM	COM
IC2140	Practical Training	5	TRN	TRN
SD2983	Design Communication and Principles	3	COM	-
SD2984	3D Graphics and Animation Fundamentals	3	COM	-
SD3985	Computer Game Development	3	COM	COM

Note:

AF	School of Accounting and Finance
AMA	Department of Applied Mathematics
CBS	Department of Chinese and Bilingual Studies
COM	Compulsory
COMP	Department of Computing
EIE	Department of Electronic and Information Engineering
ELC	English Language Centre
ELE	Elective
ENG	Faculty of Engineering
IC	Industrial Centre
SD	School of Design
TRN	Training

* Details of the Language and Communication Requirement (LCR) are set out in Section 4.2 of the programme booklet.

Note 1. Only for those students without background in Statistics.

Note 2. Only for those students without background in Calculus and Linear Algebra.