

HONG KONG BAPTIST UNIVERSITY
Faculty of Science

1. **Course Code and Course Title**

MATH 4667 Special Topics in Applied Mathematics III (3,3,0)

2. **No. of Units**

3

3. **Offering Department**

Department of Mathematics

4. **Pre-Requisite**

Year 3 standing or above or consent of instructor

5. **Co-Requisite / Anti-Requisite (if any)**

Nil

6. **Aims & Objectives**

This course introduces students the basic concepts of data analytics and equip the skill to build the model to solve the problem theoretically and practically. The programming techniques covered by this course will better help students to prepare for various employment opportunities.

7. **Course Intended Learning Outcomes (CILOs)**

CILO	By the end of the course, students should be able to:	PILO Alignment
1	Explain the fundamental principles of data analytics	1, 2
2	Identify circumstances in which particular data analytics methods are applicable	2, 3, 4
3	Write program and apply tools to perform data analytics	2, 3, 4

8. **Teaching & Learning Activities (TLAs)**

CILO No.	TLAs
1,2,3	Lectures with rigorous mathematical discussions and concrete examples. The lecturer will constantly ask questions in class to make sure that the majority of students are following the teaching materials.
1,2,3	Assignments to monitor both students' learning and mastering of the taught materials. In addition, common mistakes will also be addressed and analyzed.

9. **Assessment Methods (AMs)**

Type of Assessment Methods	Weighting	CILOs to be Address	Description of Assessment Tasks
Continuous Assessments or a mini-project	60%	1,2,3	Assessments and class exercise are designed to measure how well the students recognizing of the theory, techniques, and applications of data analytics. This may involve, but not limited to, in class discussions of rigorous technical problems and their solutions.
Final Examination (3 Hours)	40%	2,3	A self-arranged examination (orally and/or hand-written) on the use of data analytics applied to a realistic case-study problem. Students will work individually to conduct real-life case studies to apply data analytical techniques. The assessment will assess students' comprehension of key topics introduced in the course, as well as require them to demonstrate their model building and analytical skills.

10. **Assessment Rubrics**

CILO: 1 Explain the fundamental principles of data analytics

Criteria	Excellent	Good	Satisfactory	Marginal Pass	Fail
Description	Insightful and accurate explanations of the concept of fundamental principles of data analytics.	Appropriate and accurate explanations of the concept of fundamental principles of data analytics.	Reasonably accurate explanations of the concept of fundamental principles of data analytics.	Attempt in explanations of the concept of fundamental principles of data analytics.	Inappropriate explanations of the concept of fundamental principles of data analytics.

CILO: 2 Identify circumstances in which particular data analytics methods are applicable

Criteria	Excellent	Good	Satisfactory	Marginal Pass	Fail
Description	Insightful, clear and complete descriptions of the basic concepts of working knowledge of data analytics.	Appropriate and clear descriptions of the basic concepts of a working knowledge of data analytics.	Reasonably clear descriptions of the basic concepts of working knowledge of data analytics.	Attempt in descriptions of the basic concepts of working knowledge of data analytics.	Inappropriate descriptions of the basic concepts of working knowledge of data analytics.

CILO: 3 Write program and apply tools to perform data analytics

Criteria	Excellent	Good	Satisfactory	Marginal Pass	Fail
Description	Insightful, clear and complete descriptions of the basic skills and techniques in applying data	Appropriate and clear descriptions of the basic skills and techniques in applying data	Reasonably clear descriptions of the basic skills and techniques in applying data analytic	Attempt in descriptions of the basic skills and techniques in applying data analytic	Inappropriate descriptions of the basic concept of data analytic techniques.

	analytic techniques to modern applications.	analytic techniques to modern applications.	techniques to modern applications.	techniques to modern applications.	
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11. **Course Intended Learning Outcomes and Weighting**

Content	CILO No.	Teaching (in hours)
1. Introduction to Data Analytics	1,2	6
2. Introduction to Programming Concept	1,2	12
3. Method of Data Analytics	1,2,3	15
4. Application of Data Analytics	1,2,3	6

12. **Textbooks / Recommended Remarks**

References:

1. Paul Wilmott, Machine Learning: An Applied Mathematics Introduction, Panda Ohana Publishing, 2019.
2. Francois Chollet, Deep Learning with Python, Manning Publications Company, 2018.
3. Charu C. Aggarwal, Neural Networks and Deep Learning, Springer, 2018.
4. Charu C. Aggarwal, Linear Algebra and Optimization for Machine Learning, 2020.
5. Joel Grus, Data Science from Scratch: First Principles with Python, 2nd Edition, O'Reilly Media, 2019.
6. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, O'Reilly Media, 2019.
7. Marc Peter Deisenroth, A. Aldo Faisal and Cheng Soon Ong, Mathematics for Machine Learning 1st Edition, Cambridge University Press, 2020.
8. Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining, & OLAP, McGraw Hill, 2001.
9. Berry, Michael J.A. and Gordon Linoff, Mastering Data Mining, John Wiley & Sons, 2000.
10. P. Cabena, P. Hadjinian and R. Stadler, Discovery Data Mining From Concept to Implementation, Prentice Hall, 1997.
11. Han and M. Kamber, Data Mining: Concepts and Techniques, The Morgan Kaufmann Publishers, 2001.
12. Michalski Ryszard et al, Machine Learning and Data Mining Methods & Applications, John Wiley & Sons, 1998.
13. Ephraim Turban and Jay Aronson, Decision Support Systems and Intelligent Systems, Prentice-Hall, 2001.
14. Usama M. Fayyad et al, Advances in Knowledge Discovery and Data Mining, MIT Press, 1996.

13. **Course Content**

	<u>Topics</u>	<u>Hours</u>
I	Introduction to Data Analytics	6

II Introduction to Programming Concept	12
A. Basic Programming Concept	
B. Variable and Data Structure	
C. Conditional Statement	
D. Looping	
E. Function Definition	
III Method of Data Analytics	15
A. Association Rule Mining	
B. Clustering	
C. Decision Trees	
D. Machine Learning Techniques	
E. Classification and Regression Tree (CART)	
F. Neural Networks and Deep Learning	
IV Application of Data Analytics	9
A. Case Studying	

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Approved by Faculty Board via circulation on 30 August 2024.