|  | **MODULE SYLLABUS** |
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| **CONTINUOUS MATHEMATICAL FOUNDATION** |

| **MODULE CODE** | CCS1100 |
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| **MODULE TITLE** | Continuous Mathematical Foundation |
| **PROGRAMME** | Bsc (Hons) in Computer Science |
| **DEPARTMENT** | Computer Science |
| **CREDITS** | 10 |
| **STAGE OF STUDY** | 1 |
| **SEMESTER/SESSION** | Fall 2021-2022 |
| **RE-ASSESSABLE** | Yes |
| **COMPENSATABLE** | Yes |
| **LOCATION** | Thessaloniki |
| **STAFF** | Dr. Georgios Stagakis |
| **E-MAIL** | gstagakis@york.citycollege.eu |
| **STAFF OFFICE** | 6th floor |
| **ACCREDITATION** | The programme is accredited:  the British Computer Society |

| **DESCRIPTION** |
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| This introductory unit provides an understanding of the basic mathematical methods required for the study of Computer Science related problems. This course satisfies the mathematics competency requirements for a first-year student in Computer Science studies. It covers basic Statistics, Probability, Linear Algebra and Calculus. |

| **AIMS** | |
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| This module aims to: | |
| A1 | Show the mutual relevance of the two disciplines, computer science and mathematics |
| A2 | Present fundamental principles of probabilities, statistics and number distributions |
| A3 | Provide insights on fundamental calculus issues |
| A4 | Explain the fundamental concepts of linear algebra |

| **LEARNING OUTCOMES** | | |
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| By the end of the module, a student will be able to: | | Link to aims |
| LO1 | Convert problems into matrix form and apply relevant solution techniques | A4 |
| LO2 | Apply derivatives in calculating rates of change | A3 |
| LO3 | Provide evidence of comprehending the meaning of the integral | A3 |
| LO4 | Explain the relationship of calculus with computer science | A1 |
| LO5 | Process data to demonstrate its properties, by summarizing it in the form of a histogram, frequency table and by calculating the mean, median, mode, variance and standard deviation. | A2 |
| LO6 | Calculate probabilities using discrete or continuous distributions such as the binomial and Normal distributions. | A2 |
| LO7 | Calculate probabilities for (in)dependent events, (non)mutually exclusive events using the appropriate theory. | A2 |
| LO8 | Determine the distribution of a discrete or continuous random variable, by correctly interpreting the information provided in a probability distribution problem. | A2 |

| **HOW DOES THIS MODULE FIT INTO THE CURRICULUM?** |
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| Being a Computer Scientist is highly associated with applying mathematical methods while coding, in order to solve either trivial problems or include mathematical subscripts in the main code. The module’s goal is to provide the students with the appropriate math basis in order to be capable to work with future industrial computer science tasks such Machine Learning and IT Decision Support Systems. |

| **TEACHING & LEARNING METHODS** | Total Contact Hours: |  |
| --- | --- | --- |
| The following teaching & learning methods will be employed:  Lectures, emphasising each week on the respective part of the syllabus 24  Tutorials, solving exercises associated the respective week topic 12 | | |

| **ASSESSMENT METHODS** | | | | |
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| Type  # | Students will be assessed by: | Submission Week | % contribution | LOs  assessed |
|  | Portfolio | 4 | 10 | LO5, LO7 |
|  | Quiz | 6 | 40 | LO5- LO8 |
|  | Portfolio | 9 | 10 | LO1, LO2, LO4 |
|  | Quiz | 14 | 40 | LO1- LO4 |

| **FEEDBACK PROVISION** |
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| The following methods will be used to provide formative and summative feedback to students:  Detailed in-class feedback on all exercises found in in-class exercises, exercises worked at home, and questions found in both quizzes.  The feedback handbook found at <https://goo.gl/Zy2roA> aims to give you a better understanding of feedback; what it is for and how to use it. |

| **ACCESS TO MODULE MATERIAL (Notes, handouts, announcements etc.)** |
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| All material used in this module's classes are available in electronic form through Google Classroom with class code  **“m2wytgr”** |

| **RECOMMENDED TEXTBOOK(S)** |
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| Hoffman L. D., Bradley G. L., Sobecki D., Price M., Applied Calculus for Business, Economics, and the Social and Life Sciences, McGraw Hill, 11th edition, 2013. |

| **LIST OF REFERENCES / ADDITIONAL RECOMMENDED READING** |
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| 1. Baron, Michael. Probability and statistics for computer scientists. CRC Press, 2013. 2. Anderson D., Sweeney D., Williams T., Statistics for Business and Economics, South-Western, Cengage Learning, 11th Edition, 2011. 3. Lind-Marchal-Wathen, Statistical Techniques in Business and Economics, McGraw-Hill, 15th edition, 2012. 4. Robert T. Smith, Roland B. Minton, Calculus, McGraw Hill, 4th edition, 2012. |

| **OUTLINE** | |
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| **WEEK/**  **SESSION** |  |
| **#1** | Introduction to Statistics  1. Statistics Overview  2. Statistical Graphs  3. Measures of Centrality  4. Measures of Dispersion  5. Statistical Inference |
| **#2** | Set Theory  1. Sets and Subsets  2. Set Union  3. Set Intersection  4. Complementary Set  5. Sets of natural and real numbers |
| **#3** | Introduction to Probability  1. Probability space  2. Probability as set function  3. Addition Rule  4. General probability properties  5. Independency |
| **#4** | Discrete Probability Distributions  1. Probability function  2. Factorial and Combinations  2. Binomial Distribution  4. Negative Binomial Distribution  5. Hypergeometric Distribution |
| **#5** | Continuous Probability Distributions  1. Probability density function  2. Uniform Distribution  3. Exponential Distribution  4. Normal Distribution |
| **#6** | Consolidation Week |
| **#7** | Introduction to Linear Algebra  1. Vector and Matrix Definition  2. Vector and Matrix Properties  3. Transpose Matrix  4. Matrix Inverse  5. Eigenvectors and Eigenvalues  6. Linear equation systems |
| **#8** | Limits  1. Definition of Limit  2. Limit Properties  3. De l’ Hospital Theorem |
| **#9** | Differentiation  1. Definition of Derivative  2. Derivative of Basic functions  3. Derivative Properties |
| **#10** | Integration  1. Definition of Integral  2. Integration Properties |
| **#11** | Numerical Analysis  1. Trapezoidal Rule  2. Monte Carlo Integration |
| **#12** | Revision Week |

| **EMPLOYABILITY PROFILE** |
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| This module contributes to your employability profile by enhancing the following Graduate Attributes: |