

**Computer Science Techniques – Software Testing (AEC)**

**Algorithms**

**COURSE OUTLINE**

**Version: November 2021 (LP/RCC-06-2022)**

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| **Course Code** | **420 – PZ0 – GX** | **Course Length** | **45 Hours** |
| **Course Weighting** | **1 – 2 – 3** | **Credits** | **2.00** |
| **Section** | **---** | **Semester** | **---** |
| **Teacher** | **---** | **Teacher’s Contact** | **Mio** |
| **Starting Date** | **---** | **Ending Date** | **---** |

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| **1 Course Description** |  |

**Aim**

Introduction to programming, will allow the student to understand the logic behind programming of an application. Students will learn to transform the requirement into algorithm. Different pattern will be teaching to the student on how to build the algorithm according to the business process.

**Content**

At the beginning of the course, students will have an introduction to SDLC, then they will learn how to create an algorithm. This course will allow them to understand the different types of data types, instructions and data structures. The students will learn different way to describe their algorithm such as the pseudocode and flowchart. Students will learn to translate solutions in relation to a company’s requirements or issues into algorithms.

**Competencies**

After this course, students will acquire the skill to use different. This knowledge will be given to them through the classes they will attend by creating different algorithm. The planning, analysis, verification and validation will ensure the program will run according to the requirement(s).

**Position within the Program**

The algorithms will allow the student to discover the basic notions used to build the necessary knowledge in connection with the programming languages and programming methodologies seen in subsequent courses. It will also cover the concept of software testing based on algorithms.

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| **2 Competencies** |  |

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| **016W**  **PRODUCE ALGORITHMS** | |
| * Analyze the situation. | * Correct specification of input data. * Correct specification of output data. * Correct specification of the nature of the procedure. * Correct identification of the conditions for executing the algorithm. |
| * Develop the algorithm. | * Choice of a way to represent algorithms that is in accordance with company requirements. * Definition of a logical sequence of operations. * Identification of processing structures appropriate for each operation. * Strict application of syntactical rules for the chosen mode of representation. |
| * Select input and output peripherals. | * Search for an effective algorithmic solution. * Precise representation of the chosen algorithmic solution. * Inclusion of all data necessary to interpret the algorithm. * Verification of the pertinence of the solution, given the initial situation. * Identification of the errors and deficiencies of the algorithmic solution developed. * Appropriate modification of the algorithmic solution. |

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| **0172**  **ANALYZE THE FEATURES OF THE INFORMATION SYSTEMS OF VARIOUS COMPANIES WITH A VIEW TO DEVELOPING COMPUTER-AIDED SOLUTIONS** | |
| * Analyze the general characteristics of the company. | * Examination of the company's mission statement. * Examination of the type of company structure. * Examination of the corporate culture. |
| * Analyze the company's mode of operations | * Complete examination of the principle activities of the company's services. * Proper identification of the role and responsibilities of human resources within the company's different services. * Complete examination of the methods and tools used in the principle activities. * Comparison of company practices versus established operating principles. |
| * Analyze the characteristics of the flow of information within the company. | * Complete examination of the company's operational policies. * Categorization of the data associated with the different activities. * Accurate schematic of how information flows within the company. * Use of appropriate terminology. |
| * Analyze the measures taken by the company in response to legal requirements and internal policies regarding information. | * Examination of measures designed to ensure information confidentiality (access and diffusion) in view of the different services and work functions. * Examination of the means of storing and arranging information. * Examination of measures to ensure that copyright is respected. * Examination of measures to ensure that intellectual property rights are respected. |

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| **3 Lesson Plan: Daytime Format (45 Hours)** |  |

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| **Module** | **Date** | **Contents** | **Elements of Contents** | **Competencies** |
| **1**  **4hrs** |  | Introduction Algorithms / Flowchart | * Program Design and Problem-Solving Process * Algorithm * Variable & Constant * Data type * Operators:   Assignment, Logical, relational, arithmetic  Operator precedence. | 016W- 1  0172- 1,2 |
| **2**  **4hrs** |  | Flowchart /  Pseudo Code | * Representation of Flowchart Basic Instructions (read, write, etc.) * Exercises with Pseudo Code and Flowchart on instruction: Read, Write, Assignment | 0172- 1,2 |
| **3**  **4hrs** |  | Flow Control  Selection | * If / else (else if) * Nested if (else if) * Switch case | 016W- 1,2,3  0172- 1,2 |
| **4**  **4hrs** |  | Flow Control  Selection and Repetition | * Exercises with Selection Structure * Switch …case * For | 016W- 1,2,3  0172- 1,2,3 |
| **5**  **4hrs** |  | Flow Control  Repetition | * While * DO While * Repeat …Until * Exercises with while and Do-While | 016W- 1,2,3  0172- 1,2,3,4 |
| **6**  **4hrs** |  | **Review & Midterm Exam** | Subprogram   * Functions   + Procedure |  |
| **7**  **4hrs** |  | Arrays | * Create * Insert * Read * Update * Delete * Exercises with Arrays | 016W- 1,2,3  0172- 1,2,3,4 |
| **8**  **4hrs** |  | Arrays | Operation for an One Dimension array:   * Create * Insert * update * Delete and Merge | 016W- 1,2,3  0172- 1,2,3,4 |
| **9**  **4hrs** |  | Arrays | * Multidimensional Arrays(MA / n dimensions) * Operation with MA * Create * Insert * update * Read * Delete | 016W- 1,2,3  0172- 1,2,3,4 |
| **10**  **3hrs** |  | Searching algorithms | * Binary Search * Linear Search | 016W- 1,2,3  0172- 1,2,3,4 |
| **11**  **3hrs** |  | Sorting algorithms | * [Bubble Sort](https://www.tutorialspoint.com/data_structures_algorithms/bubble_sort_algorithm.htm) * Insertion Sort * Selection Sort | 016W- 1,2,3  0172- 1,2,3,4 |
| **12**  **3hrs** |  | **Review & Final Exam** |  |  |

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| **3 Lesson Plan: Evening Format (45 Hours)** |  |

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| **Module** | **Date** | **Contents** | **Elements of Contents** | **Competencies** |
| **1**  **5hrs** |  | Introduction Algorithms / Flowchart | * Program Design and Problem-Solving Process * Algorithm * Variable & Constant * Data type * Operators:   Assignment, Logical, relational, arithmetic   * Operator precedence. | 016W- 1  0172- 1,2 |
| **2**  **5hrs** |  | Flowchart /  Pseudo Code | * Representation of Flowchart Basic Instructions (read, write, etc.) * Exercises with Pseudo Code and Flowchart on instruction: Read, Write, Assignment instruction: Read, Write, Assignment | 0172- 1,2 |
| **3**  **5hrs** |  | Flow Control  Selection | * If / else * Nested if (If / else if/ else) * Switch case | 016W- 1,2,3  0172- 1,2 |
| **4**  **5hrs** |  | Flow Control  Repetition | * While * DO While * Repeat …Until * For | 016W- 1,2,3  0172- 1,2,3 |
| **5**  **5hrs** |  | **Review & Midterm Exam** | Subprogram   * + Functions   + Procedure |  |
| **6**  **5hrs** |  | Arrays | Operation for an One Dimension array:   * Create * Insert * update * Delete and Merge | 016W- 1,2,3  0172- 1,2,3,4 |
| **7**  **5hrs** |  | Arrays | Multidimensional Arrays(MA / n dimensions)   * Operation with MA * Create * Insert * update * Read * Delete | 016W- 1,2,3  0172- 1,2,3,4 |
| **8**  **5hrs** |  | Sort /Search  algorithms | * Binary Search * Linear Search * [Bubble Sort](https://www.tutorialspoint.com/data_structures_algorithms/bubble_sort_algorithm.htm) * Insertion Sort * Selection Sort | 016W- 1,2,3  0172- 1,2,3,4 |
| **9**  **5hrs** |  | **Review & Final Exam** |  |  |

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| **4 Summative Evaluation** |

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| **Evaluation Type** | **Evaluated Competencies** | **Exam Percentage** | **Date of the Evaluation** |
| **Class Assignments** |  |  |  |
| **Midterm Exam** |  |  |  |
| **Presentations** |  |  |  |
| **Final Project** |  |  |  |
| **Final Exam (Theory)** |  |  |  |
| **Final Exam (Practice)** |  |  |  |

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| **5 Teaching Method** |  |

This course will be based using several types of material such as presentation, labs, exercises and class assignments.

**Lecture**

* The lecture portion of this course will provide an understanding of course fundamentals, specifically by exploring the course theoretical content. It will help give you a head start understanding of the basic knowledge prior to the labs. The lecture is also designed to give you a broader view of the course. All overhead documents used during each lecture will be posted on the overall course website. The assigned reading should be done before the class in which the material is discussed.

**Student Participation**

* Students are expected to take part into the discussions following the demonstrations made in class.
* They are also expected to do their exercises and their assignments. Students should also take the quizzes, so that they are tested on the knowledge and skills build by this course.

**Learning Activities**

* Labs will be used to explore course content using manipulative examples, software, and other activities.
* Group discussion, student will have this time to express their point of view on a subject according to the understand that they have.

**In Class Assignments and Practices**

* In Class Assignments and Practices are a very important part of the course and in order to fully master the topics it is essential that you work carefully on every assignment and try your best to complete every problem.

**Studying Strategies**

* Students should do their lab work and finish it at home if needed, because it will be useful for the course next week.
* Students should do the same for their assignments too.
* As for theory, students should check references.
* Students are welcomed to submit problems relating to the course’s content, provided that they also propose a solution to these problems.

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| **6 Sources / References** |  |

1. Algorithms (4th Edition) Hardcover by Robert Sedgewick
2. Basic Introduction into Algorithms and Data Structures by Frauke Liers
3. Beginning Algorithms by Simon Harris and James Ross

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| **Matrix College General Academic Rules** |  |

**1) Language of Instruction**

At Matrix College, the language of instruction of all programs is either English or French, which means all classes, lectures, exams, etc. are conducted in that language only. Students are expected to be competent in the language of instruction which will have a significant impact on the students’ overall success in their program. Using any other language(s) in class or correspondence is unacceptable for both students and teachers.

**2) Attendance**

Attendance in all classes is expected for the entire length of the course. Class Attendance will be recorded at the beginning of each class and after each break. Students should note that by being absent, they risk:

* missing essential modules of the course, which are important for all exams and assignments;
* having gaps in their learning which could affect their future career opportunities;
* losing marks for in-class assignments;
* losing the chance of a “retake” exam if they are absent more than 30% of the course time (even if their final grade falls between 50% and 59%);

Students who leave after the break will be marked absent for the rest of the class. Repeated absences may result in students being referred to an Academic Advisor to sign an Academic Contract.

**3) Lateness**

All students are expected to arrive on time for all their classes. Any student who arrives later than 20 minutes (maximum) after the start of the class may be refused access to the physical or virtual classroom at the teacher's discretion. This rule also applies to late arrivals after a break.

**4) Passing Grade**

Students must obtain a final course grade of 60% or more to pass a course.

**5) Retake Exam**

Only students who receive a final course grade between 50% and 59% **and** have an attendance rate of 70% or above are eligible for a retake exam. Students whose final course grade is below 50% are not eligible for the retake exam. If the retake exam is successfully passed, the course grade will be changed to 60%. Students must apply for a retake exam (by contacting an Academic Advisor) within ten (10) working days of receiving their final course grade. If the student fails the retake exam, the student must "redo” the course.

**6) Course Redo**

Students who fail a course or fail their “retake exam” must apply to “redo” the course. Students must make an appointment with an Academic Advisor to arrange to redo the course. The College encourages students to choose the first option to redo the course offered to them, as options may be limited in the future and course fees may be applied. The first redo for the same course is free. Students who need to take a second or subsequent redo for the same course, will have to pay a fee to redo the course.

**7) Authorised Absence**

In the case of an ‘authorised absence’ from an evaluation (such as a midterm exam, final exam, presentation, etc.) a valid document (such as a medical note, etc.) must be provided to the teacher and the Academic Advisor. Upon validation of the document by the College, the student can request another chance to do the assessment or assignment at a later date approved by the teacher.

**8) Required College Appointments or Meetings**

When a student is required to attend an appointment or meeting with a college staff member, it is their responsibility to arrive on time. If the student is not able to meet at the designated time, they must, before the scheduled meeting time, inform the staff member of their valid reason for not attending. Failure to do so could result in a disciplinary action which may include suspension from all college activities.

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| **Matrix College Student Conduct During Exams** |  |

Students are expected to respect the following regulations during their evaluations:

1. Only students who are registered in the course have the right to take an exam.
2. All students must have a Student ID card to confirm their identity for all exams. Any student without a Student ID card will not be allowed to write the exam.
3. Students will not be allowed to enter the physical or virtual exam room 20 minutes after the exam has started. Students may not leave the physical or virtual exam room for any reason during the first 20 minutes of an exam.
4. Any student who arrives late will not be given extra time to complete the evaluation.
5. Students may be assigned, if necessary, a specific desk, location, or virtual breakout room by the teacher. Students must stay in that location and cannot leave without permission.
6. Students must not leave the physical or virtual examination room during the exam period for any reason unless they submit their exam sheet.
7. Students may not bring any food or drink into the examination room.
8. Students may not bring any material to the exam (coats, bags, texts, notes, books, calculators, etc.) unless authorized by the teacher.
9. All communication devices, including but not limited to cell phones, smartphones, earpieces, smartwatches, iPods, pagers, web-accessible electronic devices, etc., must be turned off and not used during the exam. Students may be requested to place these items in a location designated by the teacher.
10. The examination starts at the teacher’s signal.
11. Communication of any type (verbal, written, body language, etc.) between students is strictly forbidden.
12. Students must hand in all evaluation material(s) to the teacher or invigilator at the end of the examination period.
13. The teacher has the authority to dismiss any student from the examination room whose behaviour causes a disturbance or constitutes a threat to others' safety or security.
14. Cheating attempts or any assistance offered to others during an examination will result in a zero (0) mark in the assessment for all the involved students. This includes, but is not limited to speaking, sharing information, or looking at someone else’s work. In this case, the teacher will collect the evaluation document(s) and submit a written report to the Program Coordinator.
15. Any student involved in cheating will receive a zero (0) mark on that assessment or exam. The student will also be obligated to sign an Academic Contract in order to return to class.
16. Access to the washroom may be authorized at the teacher’s discretion.
17. Once the first student has handed in their evaluation, students are no longer permitted to leave the evaluation room for any reason.
18. Invigilators have the same powers and the same authority as teachers during evaluations. The course teacher remains the head person in control unless they delegate that role to another teacher or invigilator.
19. In Online Assessments, students are not allowed to take their exams in a shared environment (shared room with another person or at a café, restaurant, library, etc.), nor while walking, driving, or working. If they do not abide by this exam rule, they will first receive a warning from their teacher. If this behavior persists, they will be removed from the virtual examination room and will receive a zero mark (“0”) for that assessment.
20. In Online Assessments, students who switch their cameras off (even for a short time) will be asked and warned to switch on their cameras. In the case the camera remains off, they will be marked zero (0) for that assessment.
21. In Online Assessments, if any student encounters an internet connection problem, they must provide official documentation from their Internet Provider (IP) to indicate the problem, the date, the time, and the service user's name. Otherwise, the student will be marked as absent from the exam.
22. Students who do not comply with the above regulations will be dismissed from the examination room.

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| **Matrix College Harassment and Bullying Prevention Guidelines** |  |

Harassment and bullying are unacceptable behaviours at all times at Matrix College. This guideline applies to students, teachers, staff, and management and outlines the definitions of harassment and bullying and how to inform the College about any infractions.

**Harassment**

According to the Quebec Ministry of Education, harassment is defined as a repeated act of discriminatory violence that can be verbal, physical, or psychological. Harassment can be cruel, offensive and insulting, and committed by one or more individuals against a victim who cannot defend themselves.

Harassment may be, but is not limited to:

1. Physical: force and/or domination between one or more individuals and one or more victims (e.g., gestures, sexual gestures, intimidation, aggressive behavior, etc.).

2. Verbal: unwelcome remarks, suggestions and propositions; malicious gossip, jokes and jesting; offensive or inappropriate language in any form, including email or text messages, etc.

3. Non-verbal: offensive images or writing, graffiti, isolation or exclusion from activities, etc.

4. Repetitive: aggressive behaviour that is repeated regularly over a certain period of time.

Each Individual must respect the rights of others and treat everyone with dignity at all times. Harassment is based on the rejection, isolation, or stigmatization of individuals with different characteristics, such as: physical appearance (weight, height, skin colour, facial features, hair colour or type); age; race and ethnicity (culture, place of living, clothing, living habits and traditions); language; religion; sex; sexual orientation; gender identity; physical, mental, behavioral, or communicative disability/disorder; economic status; association to a particular social or cultural group; family and marital status; or any other personal choice.

**Bullying**

According to the Quebec Ministry of Education, bullying is any word, gesture, image or behaviour that hurts, humiliates, socially excludes or lowers a person's self-esteem. Bullying can be intentional or unintentional, repetitive and persistent, or expressed directly or indirectly to harm or hurt an individual. Bullying usually occurs when there is a power difference between an aggressor and a victim.

Bullying can be but is not limited to:

1. Physical: actions that injure or harm a person physically (e.g., tripping someone, intentionally shoving, hitting, showing fists, etc.).

2. Verbal: Words that hurt or harm someone psychologically (e.g., abusive, insulting, offensive, threatening, malicious, ridiculing or mocking, name-calling or making remarks about people who are different because of their gender, sexual orientation, ethnicity, etc.).

3. Social: Actions that harm a person's social relationships or association with a group (e.g., intimidating, spreading lies or rumours, gossiping, denigrating, humiliating, isolating or excluding from a group). Bullying can also be misconduct in front of an individual, especially peers.

4. Material: Actions that damage a person's living environment or deprive them of their property (e.g., destroying, vandalizing or stealing a person's property).

5. Cyberbullying: using electronic media to threaten, embarrass, intimidate, or exclude someone, or to damage their reputation (e.g., sending threatening text messages).

**Procedure**

The individual who has been the victim of harassment or bullying must notify the College (teacher, Academic Advisor, or Program Coordinator) as soon as possible. In all cases, the Campus Director and Director of Studies must be formally notified of any complaint of harassment or bullying.

*These guidelines are linked to the official Hermes Colleges Network policy document entitled “Policy Related to Workplace Violence and Harassment” (2022-11-15) and the relevant complaint form, which outline the definitions, the steps of the procedure, and those responsible for resolving a complaint. They are also linked to the “Matrix College Policy to Prevent and Combat Violence of a Sexual Nature.”*

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| **Matrix College Cheating and Plagiarism Policy** |  |

Cheating and plagiarism are unacceptable at Matrix College and are infractions against Academic Integrity. Academic Integrity is the moral code of Matrix College which is defined by honesty, fairness, and responsibility. Students are expected to be honest in their academic work, be fair to others, take responsibility for their learning, and follow educational codes and conventions.

**Cheating** refers to acting dishonestly or unfairly, either in an assignment or an exam. It can include copying during an evaluation or obtaining unauthorized exam copies.

**Plagiarism** is using someone else’s words or work and submitting it as one’s own, without full acknowledgment, mentioning, or attribution of the source. The original information may come from a book, a journal article, the web or internet sources, photographic media, a classmate’s or former student’s work, etc.

In order to remain in good academic standing, all students must observe the following standards of Academic Integrity:

* Students must study with honesty, integrity, and responsibility.
* Students must always provide references for all direct quotations and paraphrasing, including materials taken from the internet.
* Students must acknowledge all the sources used (in the form of words, images, graphs, algorithms, tables, statistics, ideas, etc.) for assignments and projects.
* Students must not copy from another student’s work or allow another student to copy from their work for assignments or exams.
* Students must not submit another person’s work as their own, or produce fake data.
* Students must not use any unauthorized aids (electronic devices, notes, study aids, etc.) in any assignment or examination.
* Students must not involve in speaking, looking at someone else’s work, passing physical or electronic notes, or any forms of communicating while taking an in-class or online exam.
* Students must not engage in walking, driving, or working while doing an online exam.
* Students must not misrepresent family or personal situations as an excuse for not attending an exam or asking for an assignment extension.
* Students must not provide fabricated documents such as false medical notes, false transcripts, etc. This is a forgery and is considered cheating.
* Students must not take an exam for another person or have someone take an exam for them.
* Students must not make any changes to an already submitted and graded work.
* Students must not assist another student in doing any of the above.

**Cheating or Plagiarism Incident Procedure**

Cheating or plagiarism is an academic offense. In all cases of cheating or plagiarism, the student(s) will receive a grade of zero (0) for that evaluation with no chance to redo the assessment or work and resubmit it. They must also meet with an Academic Advisor in order to sign an Academic Integrity Contract. The repeated act of cheating or plagiarism may result in a temporary or permanent suspension from the College. Students have the right to appeal the decision regarding the incident (See IPESA Section 5.16).

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| **Matrix College Code of Conduct** |  |

Matrix College is committed to providing a safe, caring, and inclusive learning and work environment by promoting respect and responsible citizenship for all its members. A positive college climate exists when all its members feel safe, comfortable, and accepted. This Code of Conduct applies to all college members (students, teachers, and staff) when:

* on-campus,
* online, and
* off-campus when taking part in a regular or extra-curricular college activity.

All college members are expected to abide by the following Code of Conduct:

* respect and comply with all federal, provincial, and municipal laws;
* respect and comply with the College’s rules and regulations;
* demonstrate civility, honesty, integrity, and responsibility at all times;
* respect the rights of others and treat everyone with dignity and respect at all times, regardless of economic status, physical appearance, skin colour, race and ethnicity, language, religion, sex, sexual orientation, gender identity, age, ability, etc.;
* show proper care and regard for college property and the property of others;
* respect the facilities and equipment that are being provided on campus or elsewhere: classrooms, washrooms, hallways, tables, chairs, computers, laptops, smartboards, etc.;
* respect the decorum of the building;
* take appropriate measures to help those in need; and
* be punctual and respect the full-time expectations for all college activities.

In abiding by Matrix College’s Code of Conduct, all college members must refrain from:

* any violent, harassing, or bullying behaviour (physical, verbal, social, electronic, etc.) which intentionally or unintentionally hurts (physically, socially, psychologically, or emotionally) another person; (*See “Policy Related to Workplace Violence and Harassment” (2021-11-15), for more details.*)
* threatening or making derogatory or hateful comments toward an individual or group of people;
* using technology to abuse, bully, or harass another person or group of people intentionally or unintentionally;
* using technology to interfere with the working operations and administration of the college;
* loitering anywhere in the building, behaving inappropriately on campus or in the building, eating in undesignated areas, blocking entrances, smoking in non-permitted areas, or keeping an entrance open during evenings or weekends;
* using language that is violent, profane, or discriminatory;
* wearing clothes that depict violence, profanity, or discrimination;
* accessing inappropriate materials on a digital device; and
* engaging in sexual behaviour or harassment, or conducting themselves in a way that could be construed as such, for example, by making unwelcome or inappropriate sexual remarks or physical advances, using inappropriate language, keeping or posting inappropriate materials, etc.

College members must fully understand that Matrix College is entitled to initiate legal action, permissible under law, at its discretion for any inappropriate behaviour. Any failure to abide by the above Code of Conduct may result in temporary suspension or termination of working or studying at Matrix College.

*Original Date: 2017-01-15*

*Revised: 2022-06-13*