

Undergraduate Major Project Guidelines

CAT403 – Computing Infrastructure Major Project

CAT404 – Software Engineering Major Project

CAT405 – Intelligent Computing Major Project

School of Computer Sciences

Universiti Sains Malaysia

Prepared by:

Ts. Dr. Chew XinYing [xinying@usm.my]
Program Manager (Computer Science)
CAT403, CAT404 & CAT405 Coordinator

Table of Contents

1	Undergraduate Major Project Introduction.....	4
1.1	Course Implementation.....	6
1.1.1	Phase 1: Project Bidding	7
1.1.2	Phase 2: Proposal	7
1.1.3	Phase 3: System Requirement and Design	7
1.1.4	Phase 4: Progress Review.....	7
1.1.5	Phase 5: Final Presentation.....	8
1.2	Overall timelines.....	8
1.3	Related Supporting Systems.....	11
1.3.1	Final Year Project Management System (SPTA).....	112
1.3.2	eLearn@USM	112
2	Computing Infrastructure Major Project (CAT403)	13
2.1	Course Information.....	13
2.1.1	Synopsis.....	13
2.1.2	Learning Objectives.....	13
2.2	Milestones	14
2.3	Project Criteria.....	14
3	Software Engineering Major Project (CAT404)	16
3.1	Course Information.....	16
3.1.1	Synopsis.....	16
3.1.2	Learning Objectives.....	16
3.2	Milestones	17
3.3	Project Criteria.....	17

4	Intelligent Computing Major Project (CAT405)	19
4.1	Course Information.....	19
4.1.1	Synopsis.....	19
4.1.2	Learning Objectives.....	19
4.2	Milestones	20
4.3	Project Criteria.....	20
5	Appendixes.....	21
5.1	Draft Programme Standards: Computing. Third Edition: 2022. Malaysian Qualifications Agency. Mercu MQA.	21

1 Undergraduate Major Project Introduction

Undergraduate Major Project is a project work undertaken by undergraduate students in their final year of study, in which students need to register their project according to their major specialisation. There are three major project courses based on the major specialisations, namely:

- i. **CAT403 – Computing Infrastructure Major Project.**
Field electives: Net-Centric Computing & Embedded Systems, and Cybersecurity.
- ii. **CAT404 – Software Engineering Major Project Software Engineering**
Field electives: Information Systems Development, and Specialised Systems Development.
- iii. **CAT405 – Intelligent Computing Major Project**
Field electives: Data Analytics, and Media Computing.

All CAT403, CAT404 and CAT405 projects are **individual-based** projects. To register for CAT403/CAT404/CAT405, a student must have taken the CAT302 Industrial Training and CAT304 Group Innovation Project and Study for Sustainability.

Table 1-1 shows the general course information of CAT403/CAT404/CAT405.

Table 1-1: Undergraduate major project information.

Course code:	CAT403, CAT404, CAT405		
Course title:	Undergraduate Major Project		
Units:	8	Semester:	I & II
Type:	Core	Assessment method:	100% coursework

The purpose of this guideline is to provide information for the Computer Science students on these undergraduate major project related courses.

Course Coordinator

For the academic session of 2023/2024, Ts. Dr. Chew XinYing, has been appointed as the CAT403/CAT404/CAT405 Coordinator. The main role of the CAT403/CAT404/CAT405 Coordinator is to coordinate the CAT403/CAT404/CAT405 related activities throughout the academic session.

The contact information of the CAT403/CAT404/CAT405 Coordinator is as follows:

Ts. Dr. Chew XinYing
Room 732,
School of Computer Sciences,
Universiti Sains Malaysia.
Email: xinying@usm.my
Tel: +604-6532668

1.1 Course Implementation

The implementation of the undergraduate major project consists of five major phases, namely:

- Phase 1: Project Bidding
- Phase 2: Proposal
- Phase 3: System Requirement and Design
- Phase 4: Progress Review
- Phase 5: Final Presentation

Figure 1-1 illustrates the overall project phases in a flowchart. Each of the phases will be explained in the following sub-sections.

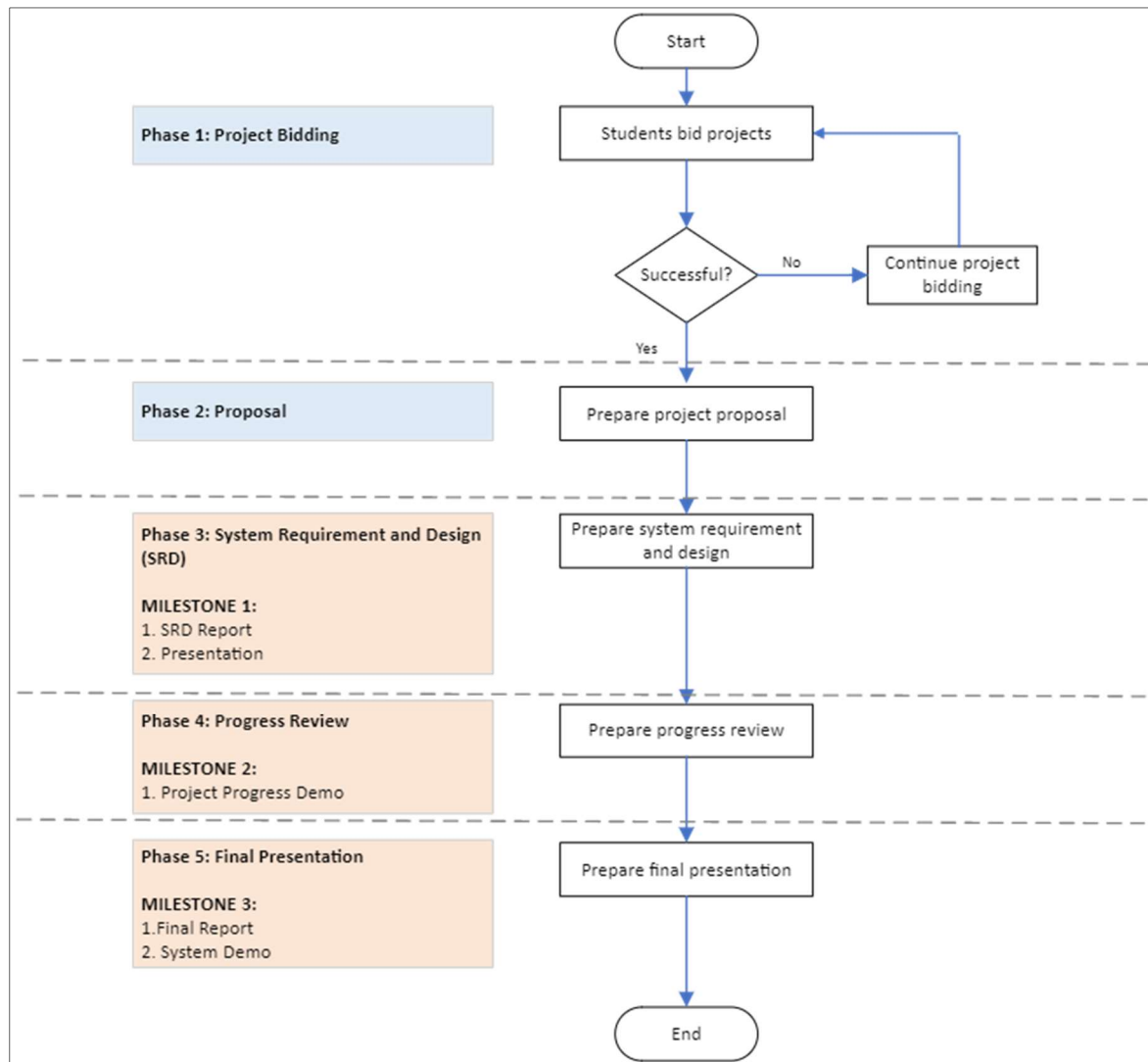


Figure 1-1: Overall phases for the undergraduate major project.

1.1.1 Phase 1: Project Bidding

Once the project bidding starts, the registered students are able to log into the SPTA to perform the project bidding. Students are required to update their profile and their skills/experiences (e.g. programming languages, projects undertaken, industrial training experiences and etc.). It is essential for the students to provide accurate information as the information will be referred to when selections are done by academic staffs. Ensure to bid projects as per your major codes; Computing Infrastructure, Software Engineering and Intelligent Computing.

The project bidding exercise will be repeated for several rounds until all students have been assigned to a project. In other words, students who fail in getting any project during the first round bidding will have another chance to bid for another project in the second round bidding and so forth.

Results of student-project bids will be announced after the relevant deadlines. Once the project bidding ends, a student will work under the supervision of an academic staff and the project will be evaluated by examiners. The supervisor and assigned examiners are the academics of PPSKOMP.

1.1.2 Phase 2: Proposal

An initial proposal is required at this stage. In order to prepare the initial proposal, the initial proposal outline and initial proposal template will be provided to the students by the respective FYP coordinators (CAT403, CAT 404 and CAT405) in a separate document.

The initial proposal will be reviewed by the respective research cluster members. The initial proposal will not be graded by the research cluster. However, the feedback from the research cluster will be made known to students, supervisors, and examiners.

1.1.3 Phase 3: System Requirement and Design

In Phase 3, there will be two deliverables to be evaluated: system requirement and design report and presentation. Students are expected to gather project requirements and perform analysis in this particular phase. Students may refer to the analysis report outline provided by the respective FYP coordinators (CAT403, CAT 404 and CAT405) in a separate document.

1.1.4 Phase 4: Progress Review

Phase 4 is the progress review demonstration. In this phase, students are required to demo the system implementation based on the system requirement and design analysis done in Phase 3.

1.1.5 Phase 5: Final Presentation

In Phase 5, which is the final phase, students are required to submit a final report and complete the system. System integration and system testing are required such that a complete and working system is produced.

1.2 Overall timelines

Table 1-2 illustrates the overall timelines for CAT403/CAT404/CAT405. The timelines are subject to change and any change will be notified via eLearn@USM.

Table 1-2: Undergraduate major project timelines.

SEM	WEEK	PROJECT PHASE	DATE	ACTIVITY	REMARKS
ONE	-1	n/a	02 Oct 2023 to 08 Oct 2023	Lecturers upload project details into SPTA. SPTA is available only for lecturers to access.	
	0	n/a	09 Oct 2023 to 15 Oct 2023	FYP Coordinators remind students to view project details in SPTA. SPTA is available for both students and lecturers to access.	
	1-2	Phase 1: Project Bidding	16 Oct 2023 to 29 Oct 2023	Students bid projects that are of interests. Lecturers perform students' selection (project confirmation). Project bidding will be conducted for many rounds until all students successfully bid for a project. Project confirmation by 29.10.2023 (Sun).	

SEM	WEEK	PROJECT PHASE	DATE	ACTIVITY	REMARKS
	3	Phase 2: Proposal	30 Oct 2023 to 05 Nov 2023	Initial proposal preparation. Initial proposal submission. Students submit project proposal: 1. Upload softcopy of the project proposal to eLearning portal. 2. Submit a softcopy of project proposal to the supervisor.	
	4-5	Phase 2: Proposal	06 Nov 2023 to 19 Nov 2023	Project proposal vetting. Lecturers review the project proposal and provide comments/suggestions to students. Assignment of examiner panels by FYP coordinators.	12 Nov 2023, (Sun) - Hari Deepavali 13 Nov 2023, (Mon) - Hari Deepavali (Replacement Holiday)
	6-9	Phase 3: System Requirement and Design	20 Nov 2023 to 17 Dec 2023	System analysis and requirements identification and report preparation. Milestone 1: System Requirement and Design (SRD) Report 1. Upload softcopy SRD Report to eLearning portal. 2. Submit a softcopy of SRD Report to supervisor and examiners.	04 Dec 2023 to 10 Dec 2023 - Mid semester break.
	10-11	Phase 3: System Requirement and Design	18 Dec 2023 to 31 Dec 2023	Milestone 1: System Requirement and Design (SRD) presentation.	25 Dec 2023 (Mon) – Christmas Day

SEM	WEEK	PROJECT PHASE	DATE	ACTIVITY	REMARKS
	12-23	Phase 3: System Requirement and Design	01 Jan 2024 to 24 Mar 2024	System design. Prototype development and testing.	1 Jan 2024 (Mon) – New Year 2024 25 Jan 2024 (Thu) – Thaipusam 10 & 11 Feb 2024 (Sat & Sun) - Chinese New Year 12 Jan 2024 (Mon) – Chinese New Year (Replacement Holiday) 12 Mar 2024 (Tue) – Awal Ramadhan
TWO	1-2	Phase 4: Progress Review	25 Mar 2024 to 07 Apr 2024	Preparation for project progress demo. Milestone 2: Project Progress Demo	28 Mar 2024 (Thu) - Nuzul Al- Quran

SEM	WEEK	PROJECT PHASE	DATE	ACTIVITY	REMARKS
	3-9	Phase 5: Final Presentation	8 Apr 2024 to 26 May 2024	System development. System integration. System testing.	10 & 11 Apr 2024 (Wed & Thu) - Hari Raya Aidilfitri 01 May 2024 (Wed) – Labour Day 22 May 2024 (Wed) – Wesak Day
	10	Phase 5: Final Presentation	27 May 2024 to 2 Jun 2024	Preparation for final system presentation. Milestone 3: Final Report 1. Upload softcopy of Final report to eLearning. 2. Submit a softcopy of final report to supervisor and examiners.	30 & 31 May 2024, (Thu & Fri) - Pesta Kaamatan 1 & 2 June 2024, (Sat & Sun) - Hari Gawai
	11-12	Phase 5: Final Presentation	3 Jun 2024 to 16 Jun 2024	Student will perform the final system demo. Milestone 3: System Demo	3 June 2024 (Mon) - YDP Agong's Birthday 17 Jun 2024, (Mon) - Hari Raya Aidiladha
	14		24 Jun 2024 to 30 Jun 2024	PIXEL 2024	

1.3 Related Supporting Systems

In order to ensure that CAT403/CAT404/CAT405 activities run smoothly, this course is supported by two systems, namely: Final Year Project Management System (SPTA), and eLearn@USM as follows:

1.3.1 Final Year Project Management System (SPTA)

The Final Year Project Management System (SPTA) is a system which is developed to support the CAT403/CAT404/CAT405 activities throughout the academic year such as project title bidding, examiners assignment, and grades entering by academic staffs. The SPTA URL is as follows: <https://sptav2.usm.my/>. Only the authorized academics and students can get access to the SPTA using the identity@USM.

1.3.2 eLearn@USM

eLearn@USM is a learning platform or course management system which is designed to provide educators, administrators and learners to create personalized learning environments. The eLearn@USM is as follows: <http://elearning.usm.my/>. Only the authorized or registered students can get access to the CAT403/CAT404/CAT405 course available in the eLearn@USM using the identity@USM.

eLearn@USM serves as a major channel for the CAT403/CAT404/CAT405 Coordinators to disseminate relevant announcements and information to the CAT403/CAT404/CAT405 students. Besides, it serves as an online submission system which permits the CAT403/CAT404/CAT405 students to submit the initial proposal, system requirement and design report, and final report.

2 Computing Infrastructure Major Project (CAT403)

2.1 Course Information

The main objective of this course is to provide students with the opportunity to explore the field of computer infrastructure in-depth and apply computer infrastructure techniques to solve problems. This course also aims to enhance students' abilities to design, analyze, and implement algorithms and system protocols based on the theory they have learned from the first year to the third year. Students will evaluate algorithms and system protocols using appropriate programming/research methods. This course challenges students to learn new topics independently without relying on formal teaching, learn how to find references, prepare reports, conduct seminars, presentations, and effectively manage their time.

2.1.1 Synopsis

This course provides an opportunity for students to study the field of computing infrastructure in depth and the implementation of appropriate programming languages and computing paradigms and theories. This course also enhances student's competence in algorithm/ protocol design, analysis of algorithms/protocols and using theories that they have learnt from Year I to Year III. Students will develop computing infrastructure applications using programming languages and programming tools. This course challenges students to learn new topics without formal classes, learn how to find references, write reports, give seminars, plan projects and manage time.

2.1.2 Learning Objectives

At the end of the project, students will be able to achieve many learning objectives, as shown in Table 3-1: Course learning outcomes mapped to the Computer Science program outcome.

Table 2-1: Course learning outcomes mapped to the Computer Science program outcome.

Course Learning Outcomes	Program Outcome - Taxonomy
1. Display efficiency in designing, analyzing, and implementing system algorithms or protocols.	Practical Skills
2. Select programming /research methods to evaluate system algorithm or protocols.	Cognitive Skills
3. Present the project deliverables clearly and with full confidence.	Communication Skills
4. Work on the project tasks with high ethical standards.	Ethics and Professionalism
5. Relate existing literatures with new ideas in conducting the project.	Personal Skills
6. Initiate a project with high potential for marketing.	Entrepreneurial Skills

2.2 Milestones

Students will be evaluated in three main milestones:

Milestone 1: System Requirement and Design

Milestone 2: Progress Review

Milestone 3: Final Presentation

2.3 Project Criteria

Item	Criteria	Description
1.	Types of Projects	The proposed project can be as the following: a web-based, standalone application, mobile apps, an embedded system, deployment of configuration and scripting, a combination of mobile apps and a web-based project. The user interface is optional depending on the type/focus of the project.
2.	Computing Infrastructure (CI) Components	<ul style="list-style-type: none">• The major contribution of the proposed project must contain Computing Infrastructure (CI) components to solve the given problem.• The proposed project must implement an improved/existing CI approaches. The CI methods may include the common, standard approach, and other methods/ approaches that are related/ applicable in CI.
3.	Clear Statement on CI Methods/ Techniques	<ul style="list-style-type: none">• The CI methods/technique to be used in the project must be stated clearly in the proposal.• The project objectives and expected outcomes must be clearly stated: specific, measurable, attainable, reasonable and within the time frame of FYP.
4.	Evaluation	<ul style="list-style-type: none">• The key evaluation criteria of the project will focus on deploying computing infrastructure (CI) methods to solve the problem and the students are able to:<ul style="list-style-type: none">○ justify the reason for choosing the selected CI methods/approaches

		<ul style="list-style-type: none"> ○ demonstrate/explain the steps of constructing the solution using the selected CI methods/approaches ○ demonstrate the acceptable and reasonable result(s) ○ integrate the whole sub-systems (if any) as one cohesive FYP project
5.	The Originality of the Project	<ul style="list-style-type: none"> • The proposed project is not necessarily a new idea/system/method. • The main focus of the project is on CI project development process and iterative/ continuous improvement/ progress from the conception until the completion of the project.
6.	Level of deployment	<ul style="list-style-type: none"> • The topic can be in the following areas but not limited to as long as the topic is/ can be related to CI: <ul style="list-style-type: none"> ○ Full deployment network/ IoT, cloud/ security protocols and applications ○ Partial deployment network/ IoT, cloud/ security protocols and applications ○ Building and testing CI methods/ elements in networking/ IoT/ cloud/ security
7.	<p>Core Computing Areas based on MQA Draft Programme Standards: Computing</p> <p>**Refer to Appendix 5.1 for the descriptions.</p> <p><i>Reference: Malaysian Qualifications Agency (MQA). (2023). Programme Standard: Computing (Version 3).</i></p>	<ul style="list-style-type: none"> • Network & Data Communication (PG 60) • Cybersecurity (PG 63) • Networking (PG 65) • Platform Technologies (PG 66) • Cloud Computing (PG 66) • Secure Computing (PG 73) • Information Assurance and Security (PG 84) • Networking and Communication (PG 86) • Parallel and Distributed Computing (PG 88) • Systems Fundamentals (PG 92)

3 Software Engineering Major Project (CAT404)

3.1 Course Information

The main objective of this course is to provide students with the opportunity to apply their software engineering knowledge more deeply. The course offers students the chance to apply their knowledge and skills in software engineering within the context of real projects. This course aims to train students in designing, developing, and implementing high-quality and relevant software solutions. Through the projects undertaken, students are expected to integrate theory and practical skills to address challenges in software engineering.

3.1.1 Synopsis

This course provides an opportunity for students to study the field of software engineering in depth and the implementation of appropriate programming languages and computing paradigms and theories. This course also enhances students' competence in developing software solutions with real-world applicability using theories that they have learned from Year I to Year III. Students will develop software engineering applications using programming languages and programming tools. This course challenges students to learn new topics without formal classes, learn how to find references, write reports, give seminars, plan projects and manage time.

3.1.2 Learning Objectives

At the end of the project, students will be able to achieve many learning objectives, as shown in Table 3-1: Course learning outcomes mapped to the Computer Science program outcome.

Table 3-1: Course learning outcomes mapped to the Computer Science program outcome.

Course Learning Outcomes	Program Outcome - Taxonomy
1. Build system solutions in accordance with project requirements and specifications.	Practical Skills
2. Demonstrate the principles and methodologies of software engineering in project implementation.	Cognitive Skills
3. Present the project deliverables clearly and with full confidence.	Communication Skills
4. Work on the project tasks with high ethical standards.	Ethics and Professionalism
5. Relate existing literatures with new ideas in conducting the project.	Personal Skills
6. Initiate a project with high potential for marketing.	Entrepreneurial Skills

3.2 Milestones

Students will be evaluated in three main milestones:

Milestone 1: System Requirement and Design

Milestone 2: Progress Review

Milestone 3: Final Presentation

3.3 Project Criteria

Item	Criteria	Description
1.	Types of Projects	The proposed projects can be focused on the computer science aspects that include the software engineering process (requirements gathering, planning, designing, coding, and testing stages of the software development lifecycle). The proposed project can be as the following: software application development, web/mobile systems development, Embedded systems development, and game development.
2.	Software Engineering (SE) Components	<ul style="list-style-type: none">• The major contribution of the proposed project must encompass software engineering processes to solve a practical problem.• The proposed project must implement a software engineering method/process/approach. The software engineering methods may include the common, standard approach, and other methods/approaches that are related/applicable in software development.
3.	Clear Statement on SE Methods/Techniques	<ul style="list-style-type: none">• The software engineering method/process/approach to be used in the project must be stated clearly in the proposal. (Select the most appropriate method/process/approach for the project development)
4.	Evaluation	<ul style="list-style-type: none">• The key evaluation criteria of the project will focus on deploying software engineering method/process/approach to solve the problem and the students are able to:

		<ul style="list-style-type: none"> justify the reason for choosing the selected software engineering method/process/approach demonstrate/explain the steps of constructing the solution using the selected software engineering method/process/approach demonstrate the workable solutions based on the proposed problem integrate the whole system & sub-systems as one cohesive FYP project (if applicable)
5.	The Originality of the Project	<ul style="list-style-type: none"> The proposed project is NOT necessarily a new system/method. If the proposed project is not new, the enhancement of the previous project must be clearly defined and follow the related software development processes.
6.	Level of deployment	The level of deployment should be Full/partial deployment on the suitable infrastructure.
7.	<p>Core Computing Areas based on MQA Draft Programme Standards: Computing</p> <p>**Refer to Appendix 5.1 for the descriptions.</p> <p><i>Reference: Malaysian Qualifications Agency (MQA). (2023). Programme Standard: Computing (Version 3).</i></p>	<ul style="list-style-type: none"> Software Requirements (PG 100) Software Design (PG 101) Software Construction (PG 102) Software Testing (PG 102) Software Sustainment (PG 103) Software Process and Life Cycle (PG 104) Software Systems Engineering (PG 104) Software Quality (PG 105) Software Measurement (PG 107) Project Management (PG 107) Behavioural Attributes (PG 108)

4 Intelligent Computing Major Project (CAT405)

4.1 Course Information

The main objective of this course is to provide students with the opportunity to delve deeply into the field of artificial intelligence and use artificial intelligence techniques to solve problems. This course also aims to enhance students' abilities in system design, algorithm analysis, and applying the theories learned from Year I to Year III. Students will develop intelligent applications using artificial intelligence approaches and appropriate programming languages and tools. This course challenges students to learn new topics independently, without formal classes, to learn how to search for references, write reports, give seminars, design projects, and manage their time effectively.

4.1.1 Synopsis

This course provides an opportunity for students to study the field of intelligent computing in depth and the implementation of appropriate programming languages and computing paradigms and theories. The course also enhances students' abilities in system design, algorithm analysis and applying the theories learned from Year I to Year III. Students will develop intelligent applications using programming languages and programming tools. This course challenges students to learn new topics without formal classes, learn how to find references, write reports, give seminars, plan projects and manage time.

4.1.2 Learning Objectives

At the end of the project, students will be able to achieve many learning objectives, as shown in Table 3-1: Course learning outcomes mapped to the Computer Science program outcome.

Table 4-1: Course learning outcomes mapped to the Computer Science program outcome.

Course Learning Outcomes	Program Outcome - Taxonomy
1. Display efficiency in designing a system, analyzing algorithms, and applying the theory of computing to develop system/application.	Practical Skills
2. Applying programming methods and research/algorithms to develop systems.	Cognitive Skills
3. Present the project deliverables clearly and with full confidence.	Communication Skills
4. Work the project tasks with high ethical standard.	Ethics and Professionalism Skills
5. Relate existing literature with new ideas in conducting the project.	Personal Skills
6. Initiate a project with high potential for marketing.	Entrepreneurial Skills

4.2 Milestones

Students will be evaluated in three main milestones:

Milestone 1: System Requirement and Design

Milestone 2: Progress Review

Milestone 3: Final Presentation

4.3 Project Criteria

Item	Criteria	Description
1.	Types of projects	The proposed project can be a web-based, standalone application, mobile app, an embedded system, a combination of mobile apps and a web-based project.
2.	Intelligent Computing components	<ul style="list-style-type: none">• The major contribution of the proposed project must contain Intelligent Computing components to solve the problem.• The proposed project must implement an improved/existing intelligent computing method/algorithm/approach. The intelligent method include the statistical approach or other method/approaches related to Intelligent Computing (IC).
3.	Clear statement on IC method/technique	<ul style="list-style-type: none">• The IC method/technique to be used in the project must be stated clearly in the proposal.
4.	Evaluation	<ul style="list-style-type: none">• The key evaluation criteria of the project will focus on deploying intelligence methods to solve the problem that is:<ul style="list-style-type: none">○ able to justify the reason for choosing the selected intelligent method/approach○ able to demonstrate/explain the steps of constructing the solution using the selected method/approach○ able to demonstrate the result(s)○ able to integrate the whole system as one FYP project
5.	The originality/eligibility of the project	<ul style="list-style-type: none">• The proposed project is not necessarily a new idea/system/method.

6.	<p>Core Computing Areas based on MQA Draft Programme Standards: Computing</p> <p>**Refer to Appendix 3.0 for the descriptions.</p> <p><i>Reference: Malaysian Qualifications Agency (MQA). (2023). Programme Standard: Computing (Version 3).</i></p>	<ul style="list-style-type: none">• Computational Science (PG 88)• Human-Computer Interaction (PG 89)• Intelligent Systems (PG 91)• Graphics and Visualisation (PG 89)• Artificial Intelligence (PG 110)• Big Data Systems (PG 110)• Data Mining (PG 111)• Machine Learning (PG 112)
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5 Appendix

5.1 Programme Standards: Computing. Third Edition: 2023. Malaysian Qualifications Agency. Mercu MQA.

<https://www2.mqa.gov.my/qad/v2/2023/PS%20Computing%203rd%20Edition%20-%2031.5.23.pdf>.