

Student Thesis Self-Assessment

Instructions to complete the form: As part of a successful graduate thesis defence, you must demonstrate that your thesis meets or exceeds the expectations concerning your performance and personal development associated with a set of attributes that are listed in the first column of the table below. The second column lists the expectations for each attribute. In the third column you should write one or more bullet points to clearly demonstrate, by providing evidence, how you have met (or exceeded) those expectations.

Student Name:

Supervisor(s):

Thesis Title:

Area	Graduate Thesis Expectation	Thesis Self-Assessment
Depth and breadth of knowledge	Good understanding of the knowledge base related to the area of research	<ul style="list-style-type: none"> • I took two graduate course related to the field of research, which are “Advance Concrete Technology” and “Foundation Design”. These courses enhanced and broadened the fundamental knowledge related to experimentation and measurements, specifically the measurement techniques I used in my research. • The other two courses I took were “Finite Element Solid I” and “Building Sustainability”. Both of these courses enhanced and broadened my knowledge related to sustainable design of buildings and finite element analysis techniques, which directly related to my research.

	Good understanding of the broader scope of the research problem and how the current research fits into the big picture is demonstrated	<ul style="list-style-type: none"> The specific focus of the research is on the investigation of static and dynamic behaviour of novel composite, which is expected to contribute to the design improvement of ultra-ductile concrete elements. The broader application of this research is the structural application of such innovative material in producing safer infrastructures with national security importance. These issues are described in detail in the Introduction and contribution sections of Chapter 1 in the thesis.
	Good knowledge of one or more specialized techniques (analytical, numerical or experimental) in the area of research	<ul style="list-style-type: none"> The thesis was experimental in nature. However, a numerical investigation was applied to present a cost effective technique in order to eliminate complications accompanied to experimental tests. I learned how to simulate the impact test using the finite element analysis ABAQUS/Explicit software and used that to calibrate and validate its data with experimental test results.
Research & scholarship (general)	Detailed review of the relevant scientific literature	<ul style="list-style-type: none"> Over 100 paper was reviewed during my research including the tensile and impact behaviour of different types of concrete. These reviews were summarized in chapter 2 in the thesis.
	Synthesis or recent advancements in the field of research	<ul style="list-style-type: none"> Although many research work were conducted in the field of impact behaviour of fibre reinforced concrete. However, the impact resistance of engineered cementitious composites was rarely investigated. This research innovatively present the behaviour of ECC incorporating shape memory alloy fibres as a reinforcement under impact loading.

	<p>Adaptation of a logical approach to address research objectives (numerical or experimental) in the area of research</p>	<ul style="list-style-type: none"> • The primary objectives in this research are: i) producing an innovative and optimum ECC mixture. ii) Evaluating its performance under static loading conditions. iii) Estimating its behaviour under impact loading. iv) Producing a FE technique to evaluate the dynamic behaviour of the new material. • To achieve the first target, five different ECC mixtures were produced including what was already made as a control mixture and different innovative mixtures. • The second objective was determined via applying different loading techniques including tensile and ductile properties of the material. • The third objective was illustrated through applying drop weight impact test on the different ECC mixtures. • Lastly, A FE analysis was presented using ABAQUS software in order to save time and efforts accompanied to experimental tests.
	<p>Presentation of research results in a systemic manner within the context of the given objectives</p>	<ul style="list-style-type: none"> • In chapter 3, the mechanical properties' test results of the composites were presented. These include the compressive, tensile and flexural strength of the composite. In addition, the elastic modulus, Poisson's ration and fracture toughness test results were illustrated. • Chapter 4 includes the tensile test results and a technique that can be used in predicting the tensile properties of the composite without applying complicated tensile tests. • In chapter 5, the drop weight impact test results were determined. • The numerical simulation results were calibrated and validated with experimental data in chapter 6.
<p>Research & scholarship (critical thinking)</p>	<p>Questioning of the viewpoints presented in the scientific literature</p>	<ul style="list-style-type: none"> • It was argued in the literature that there are many problems associated with utilizing SMA in structural applications. However, this research present a new technique in utilizing this material in structural applications to overcome such problems. • In addition, it was mentioned in the literature that ECC material has poor impact resistance when subjected to high temperatures. This research reflect the superior dynamic behaviour of the new ECC

		material that incorporates SMA fibres even subsequent to fire stimuli.
	Clear description of the critical issues/problems(s) addressed by the thesis research	<ul style="list-style-type: none"> The critical issues represented by this research are: i) overcoming the problems associated with utilizing SMA rods in structural applications. ii) Achieving superior impact resistance of ECC material with and without fire exposure. lii) Enhancing the impact resistance of ECC material through applying heat treatment in order to activate the shape memory effect. iv) Constructing a numerical model that has the ability to represent the dynamic performance of the new material.
	Logically tying of conclusions to the thesis objectives; adapted approach and related outcomes	<ul style="list-style-type: none"> The first main conclusion was the significant effect of utilizing shape memory alloy fibres in structural applications. The second main conclusion was the superior static and dynamic characteristics of the new composite compared to what was achieved in the literature.
Application of knowledge	Accurate and systematic application of existing knowledge to analyze the research problem	<ul style="list-style-type: none"> The knowledge gained via the literature review was used to design and build the experimental program. The knowledge of the ECC mixing technique was also considered to ensure accurate consistency in the experiments. The methodologies adapted in previous studies to analyze the tensile and impact test results were used in the current research. It includes equations and correlations to evaluate the static and dynamic characteristics.
Professional capacity/autonomy	Demonstration of academic integrity and research ethics	<ul style="list-style-type: none"> I conducted the research work. Appreciated suggestions were provided by one of the research team. A hint was mentioned regarding that in the acknowledge part. The results and conclusion of the previous studies were presented, cited, and referenced in each chapter.

Communication skills	Thesis form and layout is consistent with the SGPS format	<ul style="list-style-type: none"> • Thesis format complies with SGPS specifications.
	Thesis is free from typographical and grammatical errors	<ul style="list-style-type: none"> • Thesis was thoroughly reviewed and corrected from any typographical and grammatical errors.
Awareness of limits of knowledge	Awareness of the complexity of scientific problems under consideration and limitations of existing tools and techniques to address it is acknowledged and their consequences on the research outcomes are properly discussed	<ul style="list-style-type: none"> • The experimental limitations were presented and discussed in details in chapter 3, 4, and 5. • The numerical simulation limitations were illustrated in chapter 6 in details.
	Consequences of the assumptions considered in the research work and the uncertainty induced in the results due to the limitation of the research tools are clearly described	<ul style="list-style-type: none"> • The uncertainties in the experimental results came from applying the different loading techniques on small scale ECC elements. A hint regarding applying full scale tests was mentioned in chapter 7. • The uncertainties in the numerical results came from different assumptions applied to the model. These assumptions assumed homogeneity of materials, while in experiments, the composites were made from different constituents with different characteristics.

Additional Comments:

Further investigations still required in that specific field in order to capture the rapid progress in missiles and ammunitions production, paving the way for safer structural applications.

Student Signature: _____**Date:** _____