Formal Requirements Engineering Toolkit: S1/5 Project Plan

Oliver Dixon **21st October 2025**

All dates are inclusive. The project deadline is **Monday 27th April 2026 (S2/10) at 12:00**. Week markers "Cons." and "Vac." denote consolidation weeks and vacation weeks, respectively. *Emphasised text* indicates delivery of a work package or a suspension of work.

Start Week	End Week	Task Description
S1/1	S1/4	Undertake literature review discussing theoretical aspects of automated FOL theorem-provers (ATP), and existing work done in the application of ATP to requirements-engineering domains. Record core sources, and produce a project specification defining the core functionalities of the proposed solution, linking to existing literature where applicable. A draft literature review, not in the UoY template, will also be prepared.
S1/5	S1/Cons.	Produce concrete specification of SW requirements, including an artificial case study of supported engineering project and detailed feature-set, extending those elaborated in the initial project spec. Also complete Ethical Approval form and write "Statement of Ethics" in the standard UoY LaTeX dissertation template.
S1/6	S1/9	Complete, up to the initial working draft, a UML class model elaboration and corresponding C++ implementation that reflects the core capabilities of the application. This includes the following components: • The IR/AST (intermediary representation/abstract syntax tree) hierarchical model for FOL expressions. This consists of any distinct type that may occur in formalised sentences, such as constants, variables, functions (Skolem and regular), universal and existential quantifier, and binary-connected sentences. • A Flex- and Bison-based lexer and parser to build ASTs given user input conformant to a formally defined grammar. • A mutating pipeline to transform an arbitrary AST into an equivalently satisfiable AST that is invariantly defined in CNF. This may be further mutable into simple flat sets of disjunctive literals, mutually considered under conjunction.
S1/10	S1/11	*Prepare and submit* Literature Review *deliverable.*
S1/11	S1/Vac. 1	Fully integrate the existing code-base into a GTK+-based GUI application, allowing graphical specification of requirements. Once specified, requirements should be organised into a tree-based hierarchy of projects and nested subsystems, and should be viewable in a per-subsystem Requirements Index.
S1/Vac. 2	S2/0	*Project work suspended due to the Semester 1 Common Assessment Period.*
S2/1	S2/2	*Prepare and submit* Methodology and Implementation *deliverable.*

S2/2	S2/4	Develop and integrate the binary resolution and unification logic into to the existing graphical application. In addition, the following existing secondary features should be finalised during this three-week window: • LaTeX and HTML report-generation detailing the subsystem Requirements Index, results of analysis, and results of associated SW unit tests. • Integration with Google Test for transparent (driver-independent) test discovery and execution; and • Graphical interface by which requirements may be grouped and formally analysed for inconsistency or redundancy.
S2/5	S2/Cons.	Complete construction of comprehensive unit tests, including buffer to resolve identified issues with implementation. No architectural or design changes are to be made during or following this stage. Unit tests should cover the following areas: • FOL scanning and parsing, including composition of ASTs; • CNF normalisation transformers; • Symbol unification; and • Binary resolution for detection of inconsistencies and redundancies. The system should also be profiled for runtime speed and memory usage where necessary, and performance bottlenecks should be addressed where the remaining time allows.
S2/6	S2/7	Write final copy of dissertation in LaTeX template. This includes writing reflections and including appendices taken from the sources and design documentation of the final product. *Submit the full draft deliverable.*
S2/7	S2/10	*Preparation and VLE submission of the final project archive.*