Subject: **Knowledge Representation and Automatic Reasoning**

Summary: This exam will evaluate the student's introductory graduate understanding of classical artificial intelligence concepts and applications, specifically those pertaining to formal knowledge representation and symbolic reasoning. The specific subjects to be addressed are provided as keywords below:

Keywords

I – Problem-solving:

- Basic search methods (breadth-first, depth-first, heuristic-based search).
- Searching with non-deterministic actions (AND-OR tress).
- Adversarial search (minimax, alpha-beta pruning, Monte Carlo tree search).
- Constraint Satisfaction Problems (defining CSPs, inference in CSPs, backtracking search for CSPs).

II – Formal Knowledge Representation:

- Propositional logic: syntax, semantics, proof.
- First-order logic: syntax, semantics, proof, inference.
- Elements of classical planning (STRIPS/PDDL representation).
- Representing categorical knowledge (semantic web), events, and change (situation calculus).

III – Uncertain Knowledge and Reasoning:

- Conditional probability, Bayesian Networks.
- Decision-making under uncertainty: decision networks, Markov Decision Processes.