# Subject Description Form

<table>
<thead>
<tr>
<th><strong>Subject Code</strong></th>
<th>COMP406</th>
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<tbody>
<tr>
<td><strong>Subject Title</strong></td>
<td>Artificial Intelligence</td>
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<tr>
<td><strong>Credit Value</strong></td>
<td>3</td>
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<tr>
<td><strong>Level</strong></td>
<td>4</td>
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<tr>
<td><strong>Pre-requisite</strong></td>
<td>COMP305</td>
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## Objectives
- To introduce the fundamental concepts of artificial intelligence;
- To equip students with the knowledge and skills in logic programming using Prolog;
- To explore the different paradigms in knowledge representation and reasoning;
- To understand the contemporary techniques in machine learning;
- To evaluate the effectiveness of hybridization of different artificial intelligence techniques.

## Intended Learning Outcomes

### Professional/academic knowledge and skills

a. understand the history, development and various applications of artificial intelligence;

b. familiarize with propositional and predicate logic and their roles in logic programming;

c. understand the programming language Prolog and write programs in declarative programming style;

d. learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems;

e. appreciate how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory and possibility theory (fuzzy logic);

f. master the skills and techniques in machine learning, such as decision tree induction, artificial neural networks, and genetic algorithm;

g. apply and integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.

### Attributes for all-roundedness

h. explore the nature of human intelligence and its role in problem solving;

i. deepen thoughts and understanding of human abilities such as
<table>
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<tr>
<th>Subject Synopsis/Indicative Syllabus</th>
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| **1. Artificial Intelligence (AI): its roots and scope**  
Early history and applications; the development of formal logic; the Turing test; overview of AI application areas: game playing, automated theorem proving, expert systems, natural language understanding and semantics, planning and robotics, and machine learning. |
| **2. Artificial intelligence as representation and search**  
The Propositional Calculus and Predicate Calculus; using inference rules to produce predicate calculus expressions; strategies and structures for state space search; heuristic search; recursion-based search; admissibility, monotonicity and informedness of search algorithms. |
| **3. Knowledge representation and reasoning**  
Rule-based production systems; case-based reasoning systems and model based reasoning systems; reasoning under uncertain situations: stochastic methods, fuzzy logic and fuzzy set theory; fuzzy expert systems. |
| **4. Machine learning**  
Decision tree induction algorithms; artificial neural networks; genetic algorithms. |
| **5. Hybrid intelligent techniques and maintenance of intelligent systems**  
Hybridization of neural networks, fuzzy logic, genetic algorithms and other intelligent techniques for problem solving; maintenance of the completeness, correctness and consistency of intelligent systems. |

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<th>Teaching/Learning Methodology</th>
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| **Lectures**  
During the lectures, students will come across the concepts, algorithms and applications in artificial intelligence, and will be supplemented by exercises, homework and project in machine learning. During the labs / tutorials, students will have the opportunity to practice, apply, and use PROLOG, Matlab toolboxes on fuzzy logics and neural networks. Decision trees development and hybrid systems will also be introduced. |
### Assessment Methods in Alignment with Intended Learning Outcomes

<table>
<thead>
<tr>
<th>Specific assessment methods/tasks</th>
<th>% weighting</th>
<th>Intended subject learning outcomes to be assessed (Please tick as appropriate)</th>
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<tr>
<td>1. Assignments</td>
<td>15%</td>
<td>✓</td>
</tr>
<tr>
<td>2. Project</td>
<td>25%</td>
<td>✓</td>
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<tr>
<td>3. mid-term</td>
<td>15%</td>
<td>✓</td>
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<td>4. Exam</td>
<td>45%</td>
<td>✓</td>
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<tr>
<td>Total</td>
<td>100%</td>
<td>✓</td>
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### Student Study Effort Expected

**Class contact:**
- Lectures: 39 Hrs.
- Tutorials/Lab: 0 Hrs.

**Other student study effort:**
- Coursework and project: 80 Hrs.

**Total student study effort:** 119 Hrs.

### Reading List and References