<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Name</th>
<th>L-T-P -Credits</th>
<th>Year of Introduction</th>
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</thead>
<tbody>
<tr>
<td>CS367</td>
<td>Logic for Computer Science</td>
<td>3-0-0-3</td>
<td>2015</td>
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**Pre-requisites**
1. **BE101-05** Introduction to Computing and Problem Solving
2. **CS205** Data Structures

**Course Objectives**
1. To introduce the concepts of mathematical logic and its importance.
2. To discuss propositional, predicate, temporal and modal logic and their applications.

**Syllabus**
Propositional Logic, Resolution, binary decision diagrams, Predicate logic, resolution, temporal logic, deduction, program verification, modal logic.

**Expected Outcome**
Student is able to
1. Explain the concept of logic and its importance.
2. Understand fundamental concepts in propositional logic and apply resolution techniques.
3. Understand fundamental concepts in predicate logic and apply resolution techniques.
4. Understand fundamental concepts in temporal logic and apply resolution techniques.
5. Understand the concept of program verification and apply it in real-world scenarios.
6. Understand fundamental concepts in modal logic.

**Text Books**

**Reference**
<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem. Exam Marks %</th>
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<tbody>
<tr>
<td>I</td>
<td>Introductory Concepts: Mathematical Logic, Propositional Logic, First Order Logic, Modal and Temporal logic, Program Verification. <em>(Reading: Ben-Ari, Chapter 1)</em> Propositional Logic: Formulae and interpretations, Equivalence, Satisfiability&amp; Validity, Semantic Tableaux, Soundness and Completeness. <em>(Reading: Ben-Ari, Chapter 2 except 2.4, Additional Reading : Singh, Chapter 1)</em></td>
<td>06</td>
<td>15%</td>
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<td>II</td>
<td>The Hilbert Deductive System, Derived Rules, Theorems and operators, Soundness and Completeness, Consistency. <em>(Reading: Ben-Ari, Chapter 3 except 3.7 and 3.8, Additional Reading : Singh, Chapter 1)</em> Resolution in Propositional Logic: Conjunctive Normal form, Clausal form, resolution rule. <em>(Reading: Ben-Ari, Chapter 4.1, 4.2, 4.3, Additional Reading : Singh, Chapter 1)</em></td>
<td>06</td>
<td>15%</td>
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<td>III</td>
<td>Binary Decision Diagrams: Definition, Reduced and ordered BDD, Operators. <em>(Reading: Ben-Ari, Chapter 5.1 - 5.5)</em> Predicate Logic: Relations, predicates, formulae and interpretation, logical equivalence, semantic tableaux, soundness. <em>(Reading: Ben-Ari, Chapter 7.1-7.6, Additional Reading : Singh, Chapter 2)</em></td>
<td>07</td>
<td>15%</td>
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<tr>
<td>IV</td>
<td>The Hilbert deduction system for predicate logic. Functions, PCNF and clausal form, Herbrand</td>
<td>08</td>
<td>15%</td>
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</table>

For more study materials > [www.ktustudents.in](http://www.ktustudents.in)
### Second Internal Exam

| V | Temporal logic: Syntax and semantics, models of time, linear time temporal logic, semantic tableaux. Deduction system of temporal logic. (Reading: Ben-Ari, Chapter 13.1-13.5, 14.1-14.2) | 07 | 20% |

| VI | Program Verification: Need for verification, Framework for verification, Verification of sequential programs, deductive system, verification, synthesis. (Reading: Ben-Ari, Chapter 15.1-15.4, Additional Reading : Singh, Chapter 5) Modal Logic: Need for modal logic, Case Study: Syntax and Semantics of K, Axiomatic System KC, (Reading: Singh, Chapter 6.1-6.3) | 08 | 20% |

### End Semester Exam

**Assignments**

Some of the assignments can be given on an interactive theorem prover like Isabelle or Coq.

**Question Paper Pattern**

1. There will be *five* parts in the question paper – A, B, C, D, E
2. Part A
   a. Total marks : 12
   b. *Four* questions each having 3 marks, uniformly covering modules I and II; All *four* questions have to be answered.
3. Part B
   a. Total marks : 18
b. Three questions each having 9 marks, uniformly covering modules I and II; Two questions have to be answered. Each question can have a maximum of three subparts.

4. Part C
   a. Total marks: 12
   b. Four questions each having 3 marks, uniformly covering modules III and IV; All four questions have to be answered.

5. Part D
   a. Total marks: 18
   b. Three questions each having 9 marks, uniformly covering modules III and IV; Two questions have to be answered. Each question can have a maximum of three subparts

6. Part E
   a. Total Marks: 40
   b. Six questions each carrying 10 marks, uniformly covering modules V and VI; four questions have to be answered.
   c. A question can have a maximum of three sub-parts.

7. There should be at least 60% analytical/numerical questions.