F17LP Logic and Proof

COURSE DETAILS
Course Code: F17LP
Full Course Title: Logic and Proof
SCQF Level: 7
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL
Undergraduate: Yes
Postgraduate Taught: No
Postgraduate Research: No

Additional Information:

COURSE AIMS
To give an introduction to and an appreciation of the basic principles and techniques of logic and proof fundamental to Computer Science.

LEARNING OUTCOMES – SUBJECT MASTERY
By the end of the course, students should be able to:

- Construct truth tables of compound propositions.
- Determine whether a proposition is a contradiction, satisfiable or a tautology.
- Convert between different forms.
- Convert an argument into symbolic form and determine whether it is valid.
- Solve problems in propositional logic using truth-trees.
- Solve problems using Boolean algebras.
- Design simple circuits.
- Be able to interpret first order formulae.
- Solve problems in first order logic using truth-trees.

LEARNING OUTCOMES – PERSONAL ABILITIES
- Demonstrate the ability to learn independently
- Demonstrate knowledge of an area of mathematics.
- Manage time, work to deadlines and prioritise workloads

SYLLABUS
Introduction: An overview of the sorts of questions we shall be dealing with and, in particular, why mathematics is such an important ingredient in computer science.
Propositional logic: Definition of the connectives by means of truth tables; truth tables of compound propositions; graphs for propositional formulae; order of precedence rules and brackets; contradictions, satisfiable formulae, tautologies; valid arguments; equivalence relations and logical equivalence; disjunctive and conjunctive normal forms and adequate sets of connectives; truth-trees; \( P = NP \)?

Boolean algebras: Definition of Boolean algebras; the Boolean algebra of sets; the Boolean algebra of propositions; proving results about Boolean algebras; an introduction to circuit design.

First-order logic: relations; names and predicates; quantification; syntax; semantics; Truth-trees.

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