

Formal Methods

Code	Credit Hours
SE320	3-0

Course Description

In today's world, hardware and software systems are increasingly being used in safety-critical domains, like medicine, transportation, banking and military. An uncaught system bug in systems designed for these application domains can result in disastrous consequences including the loss of human life and thus approximate analysis techniques, like software testing, should not be relied upon for their analysis. This course is about an alternate analysis approach; Formal Methods. Which are computer based mathematical analysis techniques for the specification and verification of systems. The mathematical nature of Formal Methods ensures absolute correctness of software and hardware designs and thus their usage has been integrated in the industrial design flows of all critical systems. This course is particularly focused on introducing the widely used formal methods, their underlying logical theories and their main strengths and weaknesses.

Text Book:

1. Jiacun Wang, William Tepfenhart, Formal Methods in Computer Science. Chapman and Hall/CRC (Second Ed.)Published July 3, 2019
2. B. Berard, Software and System Verification, Springer

Reference Book:

1. O'Regan, Gerard, Concise Guide to Formal Methods,Theory, Fundamentals and Industry Applications (2017)

Prerequisites

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Mid Terms	30%
ESE	40%
Project	10%

ASSESSMENT SYSTEM FOR LAB

Quizzes

Assignments	
Lab Work and Report	
Lab ESE/Viva	

Teaching Plan

Week No	Topic	Learning Outcomes
1	Introduction	Formal Methods and techniques along with case studies of failed real time system
2-4	Specification	Propositional Logic, Predicate Logic, HOL
5-6	Ontology	Semantic Web and Reasoners
7-8	Modeling	Automata and Timed Automata
	MID TERM IN WEEK 9	
10-11	Verification	Temporal Logic and Verification Properties
12	Model Checking	Symbolic Model Checking
13-17	Uppaal Model Checker	Modeling, Simulation and Verification
	ESE in WEEK 18	