“Formal Methods for Engineering Applications”

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Short abstract: Formal methods are techniques used to mathematically model systems in order to verify properties in a thorough fashion. The huge diffusion of computational capabilities in embedded systems, cars, smart houses, smartphones, critical infrastructures, e-health, and the penetration of computers and software in enterprises of every dimension are posing an enormous number of new challenges for engineers. Thus, formal methods offer the potential to develop secure systems. These lectures aim to introduce some formal verification techniques that have gained great interest in the recent years and to explain how they can be used for the engineering applications.

Course content in brief:

1) **Specification language for concurrent systems (2 hours)**
2) **Temporal logic to express properties (2 hours)**
3) **Automated formal verification tools (2 hours)**
4) **Formal methods for driver detection (2 hours)**
5) **Formal methods for identifying mobile malicious behaviour (2 hours)**
6) **Formal methods for data breach mitigation in financial transactions (2 hours)**
7) **Formal methods for cancer treatment detection (2 hours)**

References:

[1] E.M.Clarke, O. Grumberg, D. Peled: “Model Checking”, MIT Press, December 1999. ISBN 0-262-03270-8

Total # of hours: 14

CV: Francesco Mercaldo was born in Firenze on 11 May, 1982. He is current a post-doctoral researcher at the Institute for Informatics and Telematics of the National Research Council of Italy (CNR) in Pisa. He received the Laurea degree in Computer Engineering at the University of Sannio, Italy, in 2012. In July 2015 he received the Ph.D. dregree in Information Engineering at the Engineering Department, University of Sannio. He is also involved as lecturer in Database, Web and Mobile Programming, Operating Systems (Bachelor Degree) and Software Security (Master Degree) courses at the University of Molise (Italy). His research interests include formal description techniques, temporal logic, formal methods in security engineering. He has written almost seventy papers for international journals and conferences.