Course PM

TDA383/DIT390, Concurrent Programming, 7.5 Hec, HT 2016

**Examiner: K. V. S. Prasad**

**Course responsible: K. V. S. Prasad**

**Course Assistants/supervisors: Raul Pardo Jiménez, Ann Lillieström, Nicholas Smallbone
External Lecturer:**

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**Course content:** Concurrent programming plays a vital role in systems where many events appear to occur simultaneously. This course aims to provide an introduction to the problems common to concurrent systems such as operating systems, distributed systems, real-time systems but also systems that require parallelization such as internet services and modern games.

General concepts: parallelism, interference, synchronisation, critical regions, mutual exclusion, deadlock, fairness, livelock. Synchronisation using shared variables; busy waiting. Semaphores. Monitors. Synchronous message passing: extended rendezvous. Asynchronous message passing. Asynchronous coordination.

**Learning outcomes:**

After completion of this course, the student should have the following:

1. Knowledge and understanding

* demonstrate the critical knowledge of the issues and problems that arise in shared-memory and message-passing concurrent systems
* identify concurrent (synchronization) problems, for example shared update, dining philosophers, producer-consumer,resource allocation

2. Skills and abilities

* design and argue for the correctness, clarity, and efficiency of solutions
* adapt common patterns for solving those problems, for example locks, client-server, pipelines, replicated workers, barrier synchronization, passing the baton
* apply practical knowledge of the programming constructs and techniques offered by modern concurrent programming languages
* implement such solutions in expressive programming languages

3. Judgement and approach

* judge whether a program or library is thread-safe or not
* pick the right language construct for solving synchronization problems

**Course structure/course implementation** *(Organization, Course distribution)*

The course is organized as lectures and laboratory assignments.

**Examination forms:**

Tentamen (Written exam), 4,5 hp Betygsskala: Underkänd (U), Godkänd (G), Väl godkänd (VG)

Laboration (Laboratory work), 3,0 hp Betygsskala: Underkänd (U), Godkänd (G)

The course is examined by an individual written exam (4.5 hec), given in an exam hall, and laboratories which are normally carried out in pairs (3.0 hec).

The exam carries 68 points, and the labs 32 points.

The labs are assigned points depending on how many resubmissions you need to pass them. For the exam, the grade boundaries are: 27 points for grade 3 (CTH) or G (GU), 41 points for garde 4 (CTH), and 54 points for grade 5 (CTH) or VG (GU).

GU students pass the course with grade G, if they pass each lab, and get grade G on the exam. For a VG grade, they need to pass each lab and get a VG on the exam.

CTH students pass the course if they pass each lab and get grade 3 on the exam. For higher grades, they need on labs and exam together, 60 points for grade 4, and 80 points for grade 5.

The examination is scheduled for 22 Oct 2016, 2 pm, at the Johanneberg campus of Chalmers. A resit is scheduled for 21 Dec 2016 at 2 pm, at the Johanneberg campus of Chalmers.

The only permitted aid at the examination is a dictionary.

**Course Literature:**

Mordechai Ben-Ari, (2006). Principles of Concurrent and Distributed Programming (2nd ed). Addison Wesley.

**Schedule:** (Planned. Check homepage for changes).

Lectures (note different lecture rooms on different week days)

* Mondays, 15:15 - 17:00, HA4
* Thursday, 8:00-9:45, HA4 (Only week 35)
* Thursday, 10:00-11:45, HC4 (Only week 36)
* Friday, 15:15 - 17:00 HC4 (Except for week 40)

Exercise/Lab supervison (you choose the slot)

* Mondays, 13:15 - 15:00, rooms:
	+ Week 35: 3354, ED3582
	+ Week 36: 3358, ED3582
	+ Week 37 - 42: 3354, 3358
* Thursdays, 8:00 - 9:45, rooms ED-3507 and ED3582
* Thursday, 10:00 - 11:45, rooms ED-3507 and ED3582

**Additional information:**