Industrial Measurement Systems for Control (IMS)

Curriculum

”The course will give knowledge in basic digital and computer technology, methods for measurement of non-electrical variables, and system construction with micro computers in systems for measurement and control.” *(Official Course Description)*

This course will provide the students with both practical and theoretical knowledge about the electro-technical components (transducers, control systems et cetera) that are used in automation of industrial processes. The intention with the course is to teach topics applicable in several areas such as production, product development, process supervision, and test & measurements. The methods for applying the components are emphasized (e.g. measurement techniques, selection of control system, programming and programming tools).

During the first study term (7 weeks) the course is given in the form of lectures and laboratory work. This forms the basis for the project work during study term lp2. The project is meant to include the solving of a practical measurement/control-task. Design of software and hardware is included. To make it easier to solve the task some project-oriented laboratory hours, PL, are inserted. During these PL we solve some sub-tasks that are common for most project groups. PL:s are only partly supervised. After each PL the group has to present the results. The lectures during study term lp2 can partly be adapted to the needs from the projects.

Please, consult the course homepage regularly: http://www.iea.lth.se/ims
A password protected part of the homepage will be used for much of the current information.

Timetable

The course is given during study terms lp1 and lp2 in the following hours:

Lp1 (2020-08-31 - - 10-20)

Lectures	Monday	10-12	KC:D	*(These hours could be changed upon*
	Thursday	13-15	KC:D	*request. The revised schedule will then*
	Friday	8-10	KC:E	*be available on the homepage.)*
Laboratory work		According to separate lists. 4 occasions. 4 hrs each.		

Lp2 (2020-11-02 - - 12-18)

Lectures	Tuesday	10-12	TBA	*(Separate schedule.)*
Project	-			
Laboratory work		Project labs will be given as a part of the project. (Approx 10 hrs.)		

Staff

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Literature

Is electronically available on the password protected part of the homepage.
(Upon request a binder with a printout can be purchased from the Department and costs 200 SEK.) The material includes:

- Textbook material
- Application examples
- Problems and solutions
- Lab PM.

Examination

The project is an important part of the course and an approved project is required for the course together with the written examination. The date for the written exam has not been set yet and will be decided during the course. Usually we set a date a few weeks before the end of the course. You will be allowed to use: instruction list for PIC16F84, TEFYMA (or similar) and a pocket calculator.

Weekly Schedule

The time for each topic is preliminary. Check the schedule link on the homepage.

Lp1:

W036	L1	Introduction. Basic OP-amp technique. (repetition)
	L2	Interfacing transducers to measurement systems using OP-amps.
	L3	Application example on temperature measurement.
W037	*Lab1*	*Preparation for transducer demonstration.*
	L4	Design with OP-amps in practice.
	L5	Digital systems. (repetition)
	L6	Transducer demonstrations by students.
W038	L7	Questions on transducers. Digital design methods.
	L8	Implementation of digital systems.
	L9	PLD-design. Languages and targets.
W039	*Lab2*	*PLD design.*
	L10	Computer technology. State machines as instruction decoders.
	L11	Memory architecture. Memory types.
	L12	Processor architecture.

W040	L13	Jumps, subroutines. Processor types.
	L14	PIC16F84 architecture and programming.
	L15	Signal interfacing.
	Lab3	*Sequential control using PIC16F84 and measurement principles*
W041	L16	Decoding and addressing around a microcomputer.
	L17	Interrupts. Real time programming in systems for measurement and control. Project catalogue presentation.
	L18	C-programming of microcontrollers.
	Lab4	*Lab-process control using PIC processor.*
W042	L19	I/O on a microcontroller. Language selection. Operating systems.
	L20	Project selection. Printed Circuit Boards (PCBs). Component mounting techniques.
	PL_A	*Programming and interfacing for an LCD-display.*

W044 Written exams (other subjects).

Lp2:

W045	L21	Electronic design using CAD/CAM.
	PL_B	*CAD/CAM. PCB production.*
W046	L22	Digital communication on circuit and system level.
	L23	EMC. Disturbances, countermeasures, and shielding.
	PL_C	*A/D, D/A and serial communication.*
W047	L24	Power supplies for electronic systems.
W048	L25	Measurement and control using rack-mounted industrial computers. PC-based measurement systems.
W049	L26	Topic on request (project related). Refresher questions.