

Silabus Mata Kuliah
Program Studi Sarjana Terapan Teknologi Rekayasa Instrumentasi

MATA KULIAH	Nama Mata Kuliah : Teknik Otomasi
	Kode MK : VI231417
	Kredit : 3 SKS
	Semester : IV

DESKRIPSI MATA KULIAH

Mata kuliah Teknik Otomasi berfungsi untuk memberikan pemahaman dan ketrampilan tentang teknik otomasi dari suatu system yang semula beroperasi secara manual (peran manusia sangat dominan) agar dapat berjalan secara otomatis (peran manusia sangat kecil sekali atau tanpa intervensi manusia dalam operasionalnya). Untuk dapat melakukan otomasi sebuah plant atau process, mahasiswa dikenalkan karakteristik proses pada plant tersebut agar memahami dinamika variable prosesnya dan variable apa yang harus dimanipulasi. Dengan diketahuinya *process variable* dan *manipulated variable*, mahasiswa diajari memilih sensor dan transmitter yang cocok dengan karakteristik dinamika proses serta mahasiswa diajari memilih actuator yang cocok dengan karakteristik *manipulated variable*. Pemahaman terhadap dinamika proses diperlukan juga untuk memilih *control mode* dan jenis controller yang dipergunakan untuk menjaga stabilitas *proses variable* yang dapat diamati dari kurva respon dinamikanya jika system diberikan gangguan.

CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEKANKAN MATA KULIAH

- Mampu mengkaji kasus penerapan ilmu pengetahuan dan teknologi di bidang keahlian sesuai standar kompetensi kerja, serta mampu mengambil keputusan secara tepat dari hasil kerja sendiri maupun kerja kelompok dalam bentuk laporan tugas akhir atau bentuk kegiatan pembelajaran lain yang luarannya setara dengan tugas akhir melalui pemikiran logis, kritis, inovatif, bermutu dan terukur dengan mempertimbangkan kesehatan, keselamatan, keamanan, dan lingkungan. (CPL 2)

- Mampu berkomunikasi, menulis laporan serta membuat presentasi secara efektif (CPL 4)
- Mampu merancang solusi untuk masalah teknologi dan rekayasa Instrumentasi serta dapat berkontribusi pada desain sistem, komponen maupun proses untuk memenuhi kebutuhan tertentu dengan mempertimbangkan standar keamanan, kesehatan dan keselamatan publik (CPL 7)
- Mampu melakukan investigasi terhadap permasalahan instrumentasi industri, mencari, memilih data yang relevan dari literatur, merancang dan melakukan eksperimen untuk memberikan kesimpulan yang valid (CPL 8)
- Mampu memilih, menggunakan dan menerapkan teknik dan sumber daya yang tepat termasuk penggunaan piranti keras maupun lunak yang mutakhir untuk memberikan solusi atas permasalahan di bidang rekayasa Instrumentasi (CPL 9)

CAPAIAN PEMBELAJARAN MATA KULIAH

- Mahasiswa mampu memahami PROCESS pada PLANT → process kontinyu dan process sequential
- Mahasiswa mampu mengidentifikasi PROCESS VARIABLE dan MANIPULATED VARIABLE
- Mahasiswa mampu mendesain Feedback Closed Loop Control System dan Open Loop Control System
- Mahasiswa mampu melakukan spesifikasi komponen Feedback Closed Loop Control beserta karakteristik nya → Sensor & Transmitter, Controller, Actuator
- Mahasiswa mampu memilih mode control → On-Off, Proportional (P), Proportional+Integral (P+I), Proportional+Integral+Derivatif (P+I+D), sesuai dengan karakteristik process variable
- Mahasiswa mampu melakukan tuning parameter control → K_p (Gain Proportional), T_i (Time Integral) dan T_d (Time Derivative), untuk mendapatkan respon dinamik plant yang stabil.

POKOK BAHASAN

- Kosep dasar Manual System dan Otomatik system
- Proses pada plant di industry (industry manufacture dan industry services)
 - Proses kontinyu,
 - Proses sekuenial,
 - Process Variable (PV)
 - Manipulated Variable (MV)
- Konsep dasar sistem pengendalian otomatis dengan umpan balik (Feedback Closed Loop Control System)
- Pemilihan komponen-komponen system pengendalian umpan balik berdasarkan karakteristik dinamika process variabel,
 - Sensor beserta spesifikasi dan penempatannya,
 - Actuator sesuai dengan karakteristik manipulate variable nya;
 - Controller beserta control mode nya,
- Tuning controller secara simulasi dengan metode kurva respon reaksi.
- Analisa respon dinamik system pengendalian dengan umpan balik

PRASYARAT

- Dasar Sistem Intrumentasi
- Dinamika Sistem
- Teknik Pengukuran
- Teknik Kalibrasi

PUSTAKA

Buku:

1. Ogata,K.,”Modern Control Engineering”, 5nd ed.,Printice-Hall, Englewood Cliffs,NJ., 2010
2. Bahram Shahian, Michael Hassul, ”Control Systems Using MATLAB”, International Editions, Printice-Hall, 1997.
3. The MathWorks, Inc., ”Control System Toolbox”, Printice-Hall, 2013.
4. Kuo,B.C., ”Automatic Control Sistem”, 6th ed., Printice-Hall, Englewood Cliffs,NJ., 1998

Silabus Mata Kuliah
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COURSE	Course Name	: Automation Engineering
	Course Code	: VI231417
	Credit	: 3 sks
	Semester	: IV

DESCRIPTION OF COURSE

The Automation Engineering course serves to provide understanding and skills about automation techniques of a system that originally operated manually (the role of humans is very dominant) so that it can run automatically (the role of humans is very small or without human intervention in its operations). To be able to automate a plant or process, students are introduced to the process characteristics of the plant in order to understand the dynamics of the process variables and what variables must be manipulated. By knowing the process variable and manipulated variable, students are taught to choose sensors and transmitters that match the dynamic characteristics of the process and students are taught to choose actuators that match the characteristics of the manipulated variable. An understanding of process dynamics is also needed to select the control mode and type of controller used to maintain the stability of the process variables which can be observed from the dynamic response curve when the system is disturbed.

LEARNING OUTCOMES

- Able to review cases of the application of science and technology in the field of expertise according to work competency standards, and able to make appropriate decisions from the results of their own work or group work in the form of final project reports or other forms of learning activities whose output is equivalent to the final task through logical, critical thinking , innovative, quality and measurable by considering health, safety, security and the environment. (CPL 2)
- Able to communicate, write reports and make presentations effectively (CPL 4)
- Able to design solutions to Instrumentation technology and engineering problems and can contribute to the design of systems, components and

processes to meet specific needs by considering public security, health and safety standards (CPL 7)

- Able to investigate industrial instrumentation problems, search, select relevant data from literature, design and conduct experiments to provide valid conclusions (CPL 8)
- Able to select, use and apply the right techniques and resources including the use of the latest hardware and software to provide solutions to problems in the field of Instrumentation engineering (CPL 9)
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COURSE LEARNING OUTCOME

- Students are able to understand PROCESS in PLANT → continuous process and sequential process
- Students are able to identify PROCESS VARIABLE and MANIPULATED VARIABLE
- Students are able to design a Feedback Closed Loop Control System and an Open Loop Control System
- Students are able to specify the Feedback Closed Loop Control components and their characteristics → Sensors & Transmitters, Controllers, Actuators
- Students are able to choose control mode → On-Off, Proportional (P), Proportional+Integral (P+I), Proportional+Integral+Derivative (P+I+D), according to the characteristics of the process variable
- Students are able to tune control parameters → Kp (Proportional Gain), Ti (Time Integral) and Td (Time Derivative), to get a stable plant dynamic response.

MAIN SUBJECT

- The basic concept of Manual System and Automatic system
- Processes at plants in industry (manufacturing industry and industrial services)
- continuous Process,
- sequential Process,
- Process Variables (PV)

- Manipulated Variables (MV)
- The basic concept of an automatic control system with feedback (Feedback Closed Loop Control System)
- Selection of the components of the feedback control system based on the characteristics of the process variable dynamics,
- Sensors and their specifications and placement,
- Actuator according to the characteristics of the manipulated variable;
- The controller and its control mode,
- Tuning the controller by simulation with the reaction response curve method.
- Analysis of the dynamic response of the control system with feedback

PREREQUISITES

- Basics of Instrumentation System
- System Dynamics
- Measurement Techniques
- Calibration Techniques

REFERENCE

Book:

1. Ogata,K.,”Modern Control Engineering”, 5nd ed.,Printice-Hall, Englewood Cliffs,NJ., 2010
2. Bahram Shahian, Michael Hassul, ”*Control Systems Using MATLAB*”, International Editions, Printice-Hall, 1997.
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