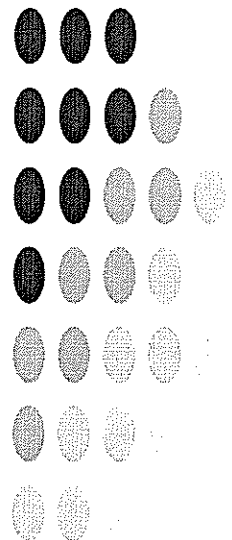


# **GBBP & SAP**

## **SEMESTER VII dan VIII**



**KURIKULUM**  
**JURUSAN TEKNIK MESIN**  
**FAKULTAS TEKNIK – UNDIP**  
**Tahun 2007**



## GARIS-GARIS BESAR PROGRAM PEMBELAJARAN

SUBJECTS TITLE	: Maintenance Management
SUBJECTS CODE	: TKM 411/2 SKS
BRIEF DESCRIPTION	: Maintenance management subjects, give ability planning of a Maintenance Management for industrial world application through knowledge assignment and skill to take a decision and problem solving in maintenance system. This thing is reflect from ability on structure maintenance management application toward a tool or a engineering system. Beside of that, also give the ability to design a correct maintenance management to apply on an institute.
GENERAL COURSE OBJECTIVES	: At the end of this semester, Mechanical Engineering student 7 <sup>th</sup> semester, able to develop and apply Maintenance Management on fields appropriately.

No	COURSE OBJECTIVES	MAIN COURSE DESCRIPTION	SUB COURSE DESCRIPTION	TIME ESTIMATE	COURSE METHOD	DESIRABLE STUDENT COMPETENCY	TEXTBOOK
1	Being giving general image about maintenance management, students majoring mechanical engineering 7 <sup>th</sup> semester expected can give objective, benefit and class learning process minimum 80% correct.	Introduction	<ul style="list-style-type: none"> <li>- TIU</li> <li>- Relevance</li> <li>- Course Contract Explanation</li> <li>- College Principle and Procedure</li> <li>- Assignment Explanation</li> <li>- Task Explanation and Grades</li> <li>- Maintenance Management general image and application</li> </ul>	100 minute	<ul style="list-style-type: none"> <li>- Students pay attention</li> <li>- Students give suggestion</li> </ul>	- Negotiation	1
	Being giving general image about organizational structure program subjects students can understand about authority and responsible distribution, planning control, and facility design also necessary technical support for operation and maintenance.	Organizational Program Structure	<ul style="list-style-type: none"> <li>- Authority and Responsibility</li> <li>- Facility Manager</li> <li>- Facility Planning</li> <li>- Engineering and Design Facility</li> <li>- Technical Support for Operation and Maintenance</li> <li>- Maintenance Type</li> <li>- Organization Principles</li> </ul>		<ul style="list-style-type: none"> <li>- Students pay attention</li> <li>- Students give suggestion</li> <li>- Lecture give students change to ask</li> <li>- Randomly ask to student about todays material</li> </ul>		1
2	Being giving general image about Operation Program, students are expected to understand design concept and to know function of Operation System in Maintenance Management. Students also can understand about annul report, execute maintenance	Operation Program Program Operasi	<ul style="list-style-type: none"> <li>- Maintenance Management Operation System Design</li> <li>- System Function</li> <li>- Annual Maintenance Operation Reports</li> <li>- Maintenance Management</li> </ul>	100 minute		Able to give opinion about maintenance operation procedure	1

	management. Students able to understand class learning minimum 80%.		Manual - Other Consideration				
3	Being giving general subjects about Operation Plan, students majoring Mechanical Engineering 7 <sup>th</sup> semester expected to give purpose, benefit and learning process planning and build Operational Plans also Quality Control Plan minimum 80% correct.	Operation Plans	- Management Operational Plans - Operational Plans Structure - Complete Facility Operational Plans - Facility Utilize Support Plans - Control Quality Plans	100 minute	- Students pay attention - Lecture give students change to ask - Randomly ask to student about todays material	Create control quality design	1
4	Being giving general subjects about Maintenance Plans students majoring Mechanical Engineering 7 <sup>th</sup> semester are expected to give purpose, benefit and learning process planning parts of a maintenance with complete observation, system and structure build, also using minimum standard performance 80% correct.	Maintenance Plans	- Equipment Observations, Systems, and Structure Build - Engineer Performance Standard Utilization Plans	100 minute	- Students pay attention - Lecture give students change to ask - Randomly ask to student about todays material	Create compact maintenance system	1
5	Being giving general subjects about Preventive Maintenance Plan, students majoring Mechanical Engineering 7 <sup>th</sup> semester are expected to understand how to plan Preventive Maintenance according necessary data's and able to understand minimum 80% correct. And students also already knew maintenance software CMMS.	Preventive Maintenance Plans	- Maintenance Preventive Procedures - Program Automation - Software - Maintenance Data's - Tools Historical Data - Equipment Facility Verification - Facility Tool	100 minute	- Students pay attention - Lecture give students change to ask - Randomly ask to student about todays material	Able to give opinion about correct maintenance type	1

			<ul style="list-style-type: none"> <li>- Labeling</li> <li>- Annual Maintenance Preventive Schedule</li> <li>- Special Schedule Arrangement</li> <li>- Computerize Report and Record</li> </ul>				
6	Being giving general subjects about Predictive Maintenance Plan, students majoring Mechanical Engineering 7 <sup>th</sup> semester are expected to understand the Predictive Maintenance benefits and technology that can applied by Predictive Maintenance also predictive process. And students are expected to know and understand the subjects learning minimum 80% correct.	Predictive Maintenance Plans	<ul style="list-style-type: none"> <li>- Predictive Maintenance Benefits</li> <li>- Predictive Maintenance Technology</li> <li>- Predictive Process</li> </ul>	100 minute	<ul style="list-style-type: none"> <li>- Students pay attention</li> <li>- Lecture give students change to ask</li> <li>- Randomly ask to student about todays material</li> </ul>	Able to create predictive maintenance system	1
7	Being giving Midterm, students are expected to evaluate learning from First to Sixth meetings 80% correct.	Midterm		100 minute			1
8	Being giving general subjects about Electric Equipments Maintenance students majoring Mechanical Engineering 7 <sup>th</sup> semester are expected to understand maintenance for several electric equipment. And students are expected to know and understand the	Electric Equipments Maintenance	<ul style="list-style-type: none"> <li>- Electric Motors</li> <li>- Control Component Maintenance</li> <li>- Electric Industry Tube-Type Control Maintenance</li> <li>- Electric Brake Maintenance</li> <li>- Industry Energy</li> </ul>	100 minute		Able to cooperate and create electric maintenance system	2

	subjects learning minimum 80% correct.		<p>Maintenance Source (Lead-Acid, Ni-Cd, Ni-Fe)</p> <ul style="list-style-type: none"> <li>- Power Distribution Equipment</li> <li>- Illumination Power</li> <li>- Solid-State Electronic</li> </ul>				
9	Being giving general subjects about Mechanical Equipment Maintenance students majoring Mechanical Engineering 7 <sup>th</sup> semester are expected to understand maintenance for several mechanical equipment. And students are expected to know and understand the subjects learning minimum 80% correct.	Mechanical Equipment Maintenance	<ul style="list-style-type: none"> <li>- Plain Bearing</li> <li>- Rolling Bearing</li> <li>- Friction Clutch</li> <li>- Flexible Clutch for Power Transmission</li> <li>- Cranes-Overhead and Granty</li> <li>- Chain Hoist</li> <li>- V-Belt Drive</li> </ul>	100 minute		Able to cooperate and create mechanical maintenance system	2
10	Being giving general subjects about Service Equipment Maintenance students majoring Mechanical Engineering 7 <sup>th</sup> semester are expected to understand maintenance for several service equipment. And students are expected to know and understand the subjects learning minimum 80% correct.	Service Equipment Maintenance	<ul style="list-style-type: none"> <li>- Air Conditioning Equipment</li> <li>- Ventilating Fans and Exhaust System</li> <li>- Dust Collecting Equipment</li> <li>- Heater Equipment</li> <li>- Power Generator Equipment</li> <li>- Centrifugal Pumps</li> <li>- Air Compressor</li> <li>- Automatic Sprinkle System</li> <li>- Valves</li> <li>- Piping</li> <li>- Portable Electric Equipment</li> <li>- Scaffold and</li> </ul>	100 minute		Able to discuss and cooperate on compact maintenance process	2

			Ladders - Effective Factory Utility Utilization and Conservation				
	Being giving assignment then students can apply directly maintenance procedure toward equipments as example equipment is easy to see like already study before.	Assignment Task	- Maintenance for several equipment seing often in surroundings - Perawatan untuk beberapa peralatan yang sering dijumpai di lingkungan sekitar				2
11.	Being giving general subjects about Lubrication students majoring Mechanical Engineering 7 <sup>th</sup> semester are expected to understand maintenance for several equipment that needed a lubricant. And students are expected to know and understand the subjects learning minimum 80% correct.	Lubrication	- Lubricant - Procedure, system and lubrication tool - Petroleum Product Conservation	100 minute		Able to discuss and cooperate on compact maintenance process	2
12	Being giving general subjects about Instrument and instrumentation students majoring Mechanical Engineering 7 <sup>th</sup> semester are expected to understand maintenance for several instrument equipment. And students are expected to know and understand the subjects learning minimum 80% correct.	Instrument and Instrumentation	- Mechanical Instrument for Variables Measurement - Measurement Electric Instrument, Service and Testing - Numerical Control - Vibration, Analysis and Corrections	100 minute		Able to discuss and cooperate on compact maintenance process	2
13	With presentation that is done by student,	Presentation		100 minute		Able to discuss	1,2

	students are expected to evaluate how far knowledge about the subjects that already achieve by the last meeting.	Task				and cooperate on compact maintenance process	
14	With presentation that is done by student, students are expected to evaluate how far knowledge about the subjects that already achieve by the last meeting.	Presentation Task		100 minute			1,2
15	With presentation that is done by students, students are expected to evaluate how far knowledge about the subjects that already achieve by the last meeting.	Presentation Task and Paper Collect		100 minute		Able to discuss and cooperate on compact maintenance process	1,2
16	If test given, students majoring Mechanical Engineering 7 <sup>th</sup> semester able to make evaluation about subjects material minimum 80% correct.	Final Test UAS		100 minute			1,2

Note :

- Interaction Activity : 1400 minute
- Unscheduled structures Activity : 1400 minute
- Independent Activity : 1400 minute

Textbook :

1. Lewis, Bernard T, "*Facility Manager's Operation and Maintenance Handbook*". McGraw – Hill Company. 1999.
2. Higgins, Linley R, P.E., "*Maintenance Engineering Handbook 3<sup>rd</sup> edition*". McGraw Hill Company.

## SATUAN ACARA PEMBELAJARAN

SUBJECTS TITLE : Maintenance Management  
 SUBJECTS CODE : TKM 411  
 SEMESTER CREDIT UNITS : 2 SCU  
 CLASS/LABORATORY SCHEDULE : 2 x 50 minute  
 LECTURE : 1 (First)

### A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES :
2. SPECIFIC OBJECTIVE : Being giving general image about maintenance management, students majoring mechanical engineering 7<sup>th</sup> semester expected can give objective, benefit and class learning process minimum 80% correct.

### B. DESIRABLE STUDENT COMPETENCY :

### C. COURSE METHOD :

### D. MAIN COURSE DESCRIPTION :

Introduction

### E. SUB COURSE DESCRIPTION :

TIU  
 Relevance  
 Course Contract Explanation  
 College Principle and Procedure  
 Assignment Explanation  
 Task Explanation and Grades

### F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION		1. Explain purpose of studying Maintenance Management 2. Explain benefit of studying Maintenance Management 3. Explain competence in TIU and TIK for first meeting	Pay attention	LCD White Board
2	PRESENTATION		4. Explains : 1. Subjects relevance between Maintenance Management with other subjects 2. Course contract Explanation 3. Course Principle and Procedure 4. Assignment Explanation 5. Task Explanation and Grades	Do or give suggestion	LCD White Board
3	CLOSING		Summarize the syllabus Give question Give general image about next subjects	Pay attention Question and Answer	LCD White Board

G. METHODS OF ASSESSMENT : Asking to a students randomly about today syllabus

H. TEXTBOOK : Lewis, Bernard T, "*Facility Manager's Operation and Maintenance Handbook*". McGraw – Hill Companies. 1999.

SUBJECTS TITLE : Maintenance Management

## COURSE OUTLINE

SUBJECT : INTERNAL COMBUSTION ENGINE  
 SUBJECT CODE : TKM..... - 2 sks 412  
 SHORT DESCRIPTION : Student able to choose, predict, and calculate machine needs and energy  
 GENERAL OBJECTIVE : Student can understand basic principle of internal combustion engine, to calculate energy, fuel needs, heat balance, refrigeration and lubrication on work cycle. Able to analyze engine dimension based on inertia forces, tangential, radial, normal, centrifugal working forces, standard procedure of combustion, crankshaft shape, combustion and injection system, and engine

No	SPEIFIC OBJECTIVE	MAIN COURSE DESCRIPTION	SUB COURSE DESCRIPTION	TIME ESTIMATION (MINUTES)	LEARNING METHOD	DESIRABLE STUDENT COMPETENCIES	TEXBOOK SOURCE
1	Understand basic principle of internal combustion engine	Energy transformation system	Relation between heat energy-mechanics, basic principle of ICE	100	presentation	Able to think systematically	Ref 1,2, and 3
2	Understand the difference and weaknesses between 2 and 4 cycle	ICE, diesel & Otto,4 takt & 2 Takt	p-v-T cycle & shaft angle,thermal efficiency,average pressure, parameter, energy produced, combustion process	100	presentation	Able to think systematically	Ref 1,2, and 3
3	Able to predict /calculate heat balance	AFR,combustion temperature	Heat balance, heat losses, exhaust heat losses and cooling system, exhaust gases, temperatur changes, lubrication system	100	Presentation and tasks	Able to think systematically	Ref 1,2, and 3
4	Able to calculate ploytropic exponent coefficient	Polytropic exponent equation	Compression and expansion process calculation based on combustion chamber composition	100	presentation	Able to think systematically	Ref 1,2, and 3
5	Able to calcute ICE energy and efficiency	Actual energy and efficiency	Mechanical losses, exhaust gases, refrigeration, specific fuel consumption, efficiency increased,quiz	100	Presentation and tasks	Able to think systematically	Ref 1,2, and 3
6	Able to calculte energy and efficiency development	Turbo and super-charged system	Turbo charge-super charge basic calculation, ways to increase engine pressure and energy	100	Presentation and tasks	Able to think systematically	Ref 1,2, and 3
7	Understan about refrigeration and its calculation	Refrigeration and lubrication system	Calculation to choose the most suitable HE, water chilling needs, pump and fan for circulation,quiz	100	presentation	Able to think systematically	Ref 1,2, and 3
8	Mid-semester					Able to think systematically	Ref 1,2, and 3
9	Understand the advantages of double cylinder	Double piston and shaft system	Inline and V double cylinderSilinder,vibration and engine balancing, its advantage	100	Presentation and tasks	Able to think systematically	Ref 1,2, and 3
10	Understan FO system	FO combustion procedure	FO determination with suitable shaft	100	Presentation and tasks	Able to think systematically	Ref 1,2, and 3
11	Able to calculate force difference on ICE	Forces work on psiton and shaft	Piston inertia force, simultaneously with gas pressure force, tangential force, radial, normal, centrifugal on shaftl, Quiz	100	Presentation and tasks	Able to think systematically	Ref 1,2, and 3
12	Able to determine engine dimension	Tptal force calcuation and engine dimension	Main component dimension consideration based on working forces and its changed	100	presentation	Able to think systematically	Ref 1,2, and 3
13	Able to determine engine dimension	Force curves and crank angle single piston	Force diference along piston movement and angle shaft difference on single piston	100	Presentation and tasks	Able to think systematically	Ref 1,2, and 3
14	Able to determine engine dimension	Force curves and crank angle double piston	Force diference along piston movement and angle shaft difference on double piston, Quiz	100	Presentation and tasks	Able to think systematically	Ref 1,2, and 3
15		Tentament		100			

**Text book :**

1. **VL. Maleev**, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. **M. Khovakh**, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. **Lichty, LC**, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## SATUAN ACARA PEMBELAJARAN (SAP)

JUDUL MATA KULIAH : Motor Bakar Torak  
KODE MATA KULIAH : TKM .....  
SKS : 2 Sks  
WAKTU PERTEMUAN : 100 menit, 1 kali seminggu  
PERTEMUAN KE : 1

### A. TUJUAN INSTRUKSIONAL

1. UMUM : Mhs memahami cara kerja MBT.
2. KHUSUS : Mhs mengerti proses perubahan energi dari pembakaran-panas-tenaga mekanis

B. KEMAMPUAN : Dapat berfikir sistematik dalam berbagai kegiatan sehari-hari dan  
SOFT SKILL mengambil keputusan yang tepat, sesuai dan benar

C. METODA : Memberi ceramah, tanya jawab

### PEMBELAJARAN

D. POKOK BAHASAN : Sistim perubahan energi

E. SUB POKOK BAHASAN : Hubungan Energi panas-mekanis, cara kerja MBT

### F. KEGIATAN BELAJAR MENGAJAR

NO	TAHAPAN	Waktu	KEGIATAN PENGAJAR	KEGIATAN MAHASISWA	MEDIA DAN ALAT PEMBELAJARAN
1	PENDAHULUAN	10	Penjelasan umum tentang sistim satuan	Mengikuti ceramah	Whiteboard
2	PENYAJIAN	70	Penjelasan proses pembakaran, perubahan energi panas menjadi energi mekanis	Mengikuti ceramah	LCD-powerpoint
3	PENUTUP	10	Tanya-jawab, kesimpulan dll	Tanya-jawab	Whiteboard

G. EVALUASI : -

H. KEPUSTAKAAN :

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 1<sup>st</sup>

### A. Course Objective

1. General Objective : Student can understand basic principle of internal combustion engine.
2. Specific Objective : Student have the ability to understand energy transformation process from heat combustion to mechanical power

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

Energy transformation system

### E. Sub Course description:

Relationship between mechanic-heat energy, basic principle of internal combustion engine

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of units	Listening	LCD White board Computer
2	PRESENTATION	80	Explaining about combustion process, heat to mechanics energy transformation	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

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### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 2<sup>nd</sup>

### A. Course Objective

1. General Objective : Student can understand basic principle of internal combustion engine.
2. Specific Objective : Student have the ability to understand enrgy transformation process from heat combustion to mechanical power

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

Internal combustion engine, diesel and otto cycle, 4 and 2 cycle

### E. Sub Course description:

Relationship between mechanic-heat energy, basic principle of internal combustion engine

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of diesel and otto, 4 and 2 cycle	Listening	LCD White board Computer
2	PRESENTATION	80	Explanation and problem exercise	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

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### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 3<sup>rd</sup>

### A. Course Objective

1. General Objective : Student can understand basic principle heating and combustion process
2. Specific Objective : Student have the ability to understand enrgy transformation process from heat combustion to mechanical power

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

AFR and heat process temperature

### E. Sub Course description:

Heat balance, heat exhaust losses and cooling system, remains gases, temperature changing in lubricated system

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of combustion, fuel needs, air	Listening	LCD White board Computer
2	PRESENTATION	80	Explaining about combustion process, heat to mechanics energy transformation	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

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### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 4<sup>th</sup>

### A. Course Objective

1. General Objective : Student can understand polytropic exponent
2. Specific Objective : Student have the ability to understand volume changed process and relation between pressure and temperature

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

Compression and expansion polytropic process

### E. Sub Course description:

Compression and expansion polytropic calculation based on combustion chamber gas composition

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of Compression and expansion polytropic process	Listening	LCD White board Computer
2	PRESENTATION	80	Explanation and how to find polytropic exponent	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

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### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 5<sup>th</sup>

### A. Course Objective

1. General Objective : Student can understand energy produced by internal combustion engine and its efficiency
2. Specific Objective : Student have the ability to calculate energy produced by internal combustion engine and its efficiency

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

Actual energy and efficiency

### E. Sub Course description:

Mechanical losses, exhaust gasses, refrigeration, specific fuel consumption, way to increase efficiency

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of actual energy and efficiency	Listening	LCD White board Computer
2	PRESENTATION	80	Actual and energy efficiency calculations of internal combustion engine	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

Tsk and Quiz

### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 6<sup>th</sup>

### A. Course Objective

1. General Objective : Student can understand basic principle, uses, and the purpose of turbo-charge on ICE (Internal Combustion Engine)
2. Specific Objective : Student have the ability to calculate the needed of super/turbo-charge also to increase its efficiency

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

Super and Turbo-Charged

### E. Sub Course description:

Basic calculations of turbo and super-charge to increase pressure and engine energy

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of Super and Turbo-Charged	Listening	LCD White board Computer
2	PRESENTATION	80	Actual and energy efficiency calculations of super and turbo-charge	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

Tsk and Quiz

### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 7<sup>th</sup>

### A. Course Objective

1. General Objective : Student can understand basic principle of refrigerated and lubricated ICE
2. Specific Objective : Student have the ability to calculate the needed of pump and fan for ICE chilled and lubricated

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

Refrigeration and Lubrication system

### E. Sub Course description:

Basic calculations to choose the right HE, chilling water. Pump and fan for circulation

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of Refrigeration and lubrication system	Listening	LCD White board Computer
2	PRESENTATION	80	Pump and specification calculation	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

Tsk and Quiz

### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 8<sup>th</sup>

### A. Course Objective

1. General Objective : Student can understand basic principle of double piston and its use on ICE
2. Specific Objective : Student have the ability to understand energy transformation produced in ICE

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

Double piston system

### E. Sub Course description:

Inline-Double piston and V, vibration and engine balancing, and its advantage

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of inline and V double piston	Listening	LCD White board Computer
2	PRESENTATION	80	Energy increased calculations using double piston	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

Task

### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 9<sup>th</sup>

### A. Course Objective

1. General Objective : Student can understand multi piston combustion procedure on ICE
2. Specific Objective : Student have the ability to understand how important FO is for engine stability

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

FO combustion procedure

### E. Sub Course description:

Choosing FO with the right crank

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of FO	Listening	LCD White board Computer
2	PRESENTATION	80	Explaining about crankshaft suitable fo FO	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

Task and Quiz

### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 10<sup>th</sup>

### A. Course Objective

1. General Objective : Student can understand forces on ICE piston and crank
2. Specific Objective : Student have the ability to calculate forces on piston and shaft, with its change

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

Forces on piston and crank

### E. Sub Course description:

Piston inertia forces, simultaneously with pressure force, tangential force, radial, centrifugal, and normal on crank

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Explaining about forces on piston and crank	Listening	LCD White board Computer
2	PRESENTATION	80	Inertia, normal centrifugal, tangential forces on piston	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

Task

### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
Subject Code : TKM 211  
Subject Credit : 2  
Class schedule : 1 x 100 minutes  
Lecture : 11<sup>th</sup>

### A. Course Objective

1. General Objective : Student can understand ICE dimension depends on energy needed and working rotation
2. Specific Objective : Student have the ability to calculate main dimension of ICE, piston, shaft, pad, clep, etc.

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

ICE main dimension

### E. Sub Course description:

Choosing Main dimension based on changeable forces

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Explaining about ICE main dimension	Listening	LCD White board Computer
2	PRESENTATION	80	Main dimension calculation and affected factor	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

Task and Quiz

### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 12<sup>th</sup>

### A. Course Objective

1. General Objective : Student can understand ICE force change related to crank angle on ICE single piston
2. Specific Objective : Student have the ability to calculate and make changeable force curve related to crank angle

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

Force curve vs crank angle on single piston

### E. Sub Course description:

Changeable forces on piston movement and crank angle changes single piston

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Explaining about the relation between forces and single piston crank angle	Listening	LCD White board Computer
2	PRESENTATION	80	Forces produced calculations and its changes	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

Task

### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## STANDARD COURSE OUTLINE

Subject : INTERNAL COMBUSTION ENGINE  
 Subject Code : TKM 211  
 Subject Credit : 2  
 Class schedule : 1 x 100 minutes  
 Lecture : 13<sup>th</sup>

### A. Course Objective

1. General Objective : Student can understand force changes related to double piston crank angle on ICE
2. Specific Objective : Student have the ability to calculate and make force changeable curve related to crank angle

### B. Desirable student competencies:

Systematical thinking in real life, and to choose the right decisions

### C. Course Method:

Presentation, Question and answer, problem exercise.

### D. Main course description:

Force curve vs crank angle on double piston

### E. Sub Course description:

Changeable forces along piston movement and crank angle changes double piston

### F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Explaining about the relation between forces and double piston crank angle	Listening	LCD White board Computer
2	PRESENTATION	80	Forces produced calculations and its changes	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

### G. Method of assessment

Task and Quiz

### H. Text Book

1. VL. Maleev, *Internal Combustion Engines*, Mc Graw Hill, Kogakusha
2. M. Khovakh, *Motor Vehicle Engines*, Mir Publ., Moscow.
3. Lichty, LC, *Combustion Engine Processes*, Mc Graw Hill Book Co, New York, 1985

## DIRECTION OF TEACHING PROGRAM

**SUBJECT TITLE** : ENGINEERING MEASUREMENT  
**INDEX NUMBER/CREDITS** : TKM-415/2  
**BRIEF DESCRIPTION** : This subject gives general explanation about concept and application of control system science that is often used for research sector as well as development on engineering system  
**GENERAL INSTRUCTION PURPOSES** : In order to students understand about control system, develop its mathematical model, model behavior, identify characteristic of control system, design controller and can use MATLAB software as tool for control analysis

NO	SPECIAL INSTRUCTION PURPOSES	MAIN SUBJECTS	SUB MAIN SUBJECTS	TIME ESTIMATION (MINUTES)	TEACHING METHODS	SOFT SKILL CAPABILITY	REFERENCE SOURCES
1	Show mathematical model from some component that have control system	Introduction and mathematical basic	Understanding, system component and kind of feedback control also software that is used in control analysis	120	Attendance, discussion, homework	Can distinct kind of control and use MATLAB software to help in control system analysis process	1
2	Develop mathematical model from engineering system include electric and mechanic	Physical system model and linearization	Laplace transformation, differential equations and transfer function from electrical modelling and mechanical system, block diagram	120	Attendance, discussion, practise	Can simplify system in transfer function	1
3	Know procedure for linearization from some non-linear system	Physical system model and linearization	Linearization procedure, linearization process, linearization applications	120	Attendance, discussion, practise, homework	Know application of linearization from system	1
4	Predict model behavior of transfer	State variables	More of the state space, state space	120	Attendance, discussion,	Can look for result of state space	1

	function and state space		equations, transfer function correlation to state space, state space and transfer function stability		practise, homework	equation from system	
5	Know kind of response from analogue linear system include frequency response concepts	Response system	Time response of first and second order, specification on control system plan, frequency response from system, use transfer function and bode plot to identify time constants, bandwidth definition	120	Attendance, discussion, practise, homework	Can use transfer function, bode plot, can identify time constant, DC gain, damping, natural frequency, and PO	1
6	Identify principle from characteristic of control system	Characteristic of control system	Closed-loop control system, stability, sensitivity, removal of disturbance, accuracy of steady state, closed loop frequency response	120	Attendance, discussion, practise	Can calculate steady state error for input step and ramp	1
7	Know principle of Routh-Hurwitz stability	Analysis of stability	Defining BIBO, Routh-Hurwitz, stability criteria, characteristic equation root	120	Attendance, discussion, practise, homework	Can use MATLAB to check Routh-Hurwitz stability	1
8	Identify analysis procedure and design	Root Locus	Define root locus, application of root locus, root locus	120	Attendance, discussion, practise	Can use MATLAB to check root-locus performance	1
9	Use root locus in application of some kind of controller	Root Locus	Using root locus for design control system, sample of	120	Attendance, discussion, practise,	Can use MATLAB to check root-locus performance on	1

			phase lead controller, P, PI, PD and PID		homework	some kind of controller	
10	Can understand the important of frequency response analysis	Frequency response analysis and bode plot	Frequency response, bode plot diagram, time delay phenomena on physical system	120	Attendance, discusion, practise	Can use MATLAB to make bode plot diagram	1
11	Can use response frequency analysis for some controller	Frequency response analysis and bode plot	Relationship between bode plot with response system, modify response system with using bode plot, sample of phase lead controller, P, PI, PD and PID	120	Attendance, discusion, practise, homework	Can explain bode plot related to controller frequency response	1
12	Know and understand one of controller principle is PID controller	PID controller and phase lead compensation	PID controller design, PID controller design analysis, implementation of PID controller	120	Attendance, discusion, practise	Can distinct kind of controller, P, I, D, or its cluster	1
13	Know and understand principle of phase lead compensation kind	PID controller and phase lead compensation	Phase lead controller design, phase lead design analysis, phase lead compensation	120	Attendance, discusion, practise, homework	Can distinct between phase lead with phase lag	1

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
 LECTURE : 1  
 A. COURSE OBJECTIVES :  
     1. GENERAL OBJECTIVE : Student will have knowledge of control systems in industrial application  
     2. SPECIFIC OBJECTIVE : Student will learn mathematical modeling techniques from several control system component  
 B. SOFT SKILL COMPETENCY : Students will learn type of control system and will able to use MATLAB software for analysis  
 C. COURSE METHOD : Theoretical lectures, discussion  
 D. MAIN COURSE DESCRIPTION : Introduction & Mathematical basic equation  
 E. SUB COURSE DESCRIPTION : Definition, system of component, type of feedback control system and control system analysis using software  
 F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	15	How to implement controls and are aware of standard industrial practices and engineering field	Listening	LCD, Whiteboard
2	MAIN LECTURE	90	Definition of feedback kontrol system, type and component of feedback control system, software	Listening	LCD, Whiteboard
3	CONCLUSION	15	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations  
 H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
 LECTURE : 2
- A. COURSE OBJECTIVES :
1. GENERAL OBJECTIVE : Students learn theoretical and applied modeling techniques to characterize physical systems
  2. SPECIFIC OBJECTIVE : Derive mathematical models of a variety of electrical, mechanical and electro-mechanical systems
- B. SOFT SKILL COMPETENCY : Student will able to determine transfer function of electrical, mechanical and electro-mechanical system
- C. COURSE METHOD : Theoretical lectures, discussion
- D. MAIN COURSE DESCRIPTION : Model of physical systems and linearization
- E. SUB COURSE DESCRIPTION' : Laplace transform, diferential equation, block diagram and transfer function of electro-mechanical system
- F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	15	Laplace equation	Listening	LCD, Whiteboard
2	MAIN LECTURE	90	Laplace transforms, diferential equation and transfer function of electrical modeling, mechanical system, and block diagram	Listening	LCD, Whiteboard
3	CONCLUSION	15	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations
- H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
 LECTURE : 3  
 A. COURSE OBJECTIVES :  
     1. GENERAL OBJECTIVE : Students are able to understand linearization process of non-linear system  
     2. SPECIFIC OBJECTIVE : Students are able to know procedure for linearization of some non-linear system  
 B. SOFT SKILL COMPETENCY : Able to know application of linearization from system  
 C. COURSE METHOD : Theoretical lectures, discussion  
 D. MAIN COURSE DESCRIPTION : Physical System Model and Linearization  
 E. SUB COURSE DESCRIPTION : Linearization Procedure, Linearization Process, Linearization Application  
 F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	15	Teaching about linear and non linear system	Listening	LCD, Whiteboard
2	MAIN LECTURE	90	Teaching about linearization procedure, process and application of linearization from system that initially non linear r	Listening	LCD, Whiteboard
3	CONCLUSION	15	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations  
 H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
 LECTURE : 4  
 A. COURSE OBJECTIVES :  
     1. GENERAL OBJECTIVE : Students are able to understand state space equation that better than transfer function  
     2. SPECIFIC OBJECTIVE : Students are able to predict behavior of transfer function and state space model  
 B. SOFT SKILL COMPETENCY : Able to find state space equation value from a system  
 C. COURSE METHOD : Theoretical lectures, discussion  
 D. MAIN COURSE DESCRIPTION : State variables  
 E. SUB COURSE DESCRIPTION : State space, state space equation, correlation between transfer function and state space, state space stability analysis and transfer function  
 F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	15	Teaching briefly about transfer function	Listening	LCD, Whiteboard
2	MAIN LECTURE	90	Teaching about reason why state space is used, state space advantage, state space equation, transfer function correlation to state space, state space stability analysis and transfer function	Listening	LCD, Whiteboard
3	CONCLUSION	15	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations  
 H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
 LECTURE : 5
- A. COURSE OBJECTIVES :
1. GENERAL OBJECTIVE : Students are able to understand the important of time response analysis and response frequency on control system planning process
  2. SPECIFIC OBJECTIVE : Students are able to know kinds of response from linear analog system include response frequency concept
- B. SOFT SKILL COMPETENCY : Able to use transfer function, bode plot, identify time constant, DC gain, damping, natural frequency, and PO
- C. COURSE METHOD : Theoretical lectures, discussion
- D. MAIN COURSE DESCRIPTION : Response System
- E. SUB COURSE DESCRIPTION : First and second order system time response, response specification on control system design, response frequency from system, use transfer function and bode plot to identify time constant, definition bandwidth
- F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	15	Teaching briefly about response analysis of control system	Listening	LCD, Whiteboard
2	MAIN LECTURE	90	Teaching about first and second order system time response , response specification on control system design response frequency from system, use transfer function and bode plot. Beside that also explanation about bandwidth definition and identify on bode plot diagram	Listening	LCD, Whiteboard
3	CONCLUSION	15	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations
- H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
 LECTURE : 6  
 A. COURSE OBJECTIVES :  
     1. GENERAL OBJECTIVE : core from control system characteristic  
     2. SPECIFIC OBJECTIVE : Students are able to identify principle from control system characteristic  
 B. SOFT SKILL COMPETENCY : Able to calculate steady state error for input step and ramp  
 C. COURSE METHOD : Theoretical lectures, discussion  
 D. MAIN COURSE DESCRIPTION : Control System Characteristic  
 E. SUB COURSE DESCRIPTION : Closed-loop control system, stability, sensitivity, removal disturbance, steady-state accuration, closed-loop response frequency  
 F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	15	Teaching how to get closed-loop transfer function	Listening	LCD, Whiteboard
2	MAIN LECTURE	90	Teaching about closed loop control system, stability, sensitivity, removal disturbance, steady state accuration, closed loop response frequency	Listening	LCD, Whiteboard
3	CONCLUSION	15	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations  
 H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
LECTURE : 7
- A. COURSE OBJECTIVES :
1. GENERAL OBJECTIVE : Students are able to analyze that used to know stability of a control system
  2. SPECIFIC OBJECTIVE : Students are able to know Routh-Hurwitz stability principle
- B. SOFT SKILL COMPETENCY : Able to use MATLAB to check Routh-Hurwitz stability
- C. COURSE METHOD : Theoretical lectures, discussion
- D. MAIN COURSE DESCRIPTION : Analisis Stabilitas
- E. SUB COURSE DESCRIPTION' : Definisi BIBO, kriteria stabilitas Routh-Hurwitz, akar dari persamaan karakteristik
- F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	15	Teaching briefly about stability	Listening	LCD, Whiteboard
2	MAIN LECTURE	90	Teaching about bounded input bounded output (BIBO) definition, Routh-Hurwitz stability criteria and roots from characteristic equations	Listening	LCD, Whiteboard
3	CONCLUSION	15	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations
- H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
 LECTURE : 8  
 A. COURSE OBJECTIVES :  
     1. GENERAL OBJECTIVE : Students are able to understand analysis concept and control system design that use root locus method  
     2. SPECIFIC OBJECTIVE : Students are able to identify analysis procedure and root locus method  
 B. SOFT SKILL COMPETENCY : Able to use MATLAB to check root locus performance  
 C. COURSE METHOD : Theoretical lectures, discussion  
 D. MAIN COURSE DESCRIPTION : Root Locus  
 E. SUB COURSE DESCRIPTION : Root-locus definition, application of root-locus, engineering root-locus  
 F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	15	Teaching briefly about root-locus method	Listening	LCD, Whiteboard
2	MAIN LECTURE	90	Teaching about root locus definition, application of root locus, engineering root locus and show how to use MATLAB to know root locus performance	Listening	LCD, Whiteboard
3	CONCLUSION	15	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations  
 H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
 LECTURE : 9
- A. COURSE OBJECTIVES :
1. GENERAL OBJECTIVE : Students are able to understand analysis concept and control system design that use root locus method
  2. SPECIFIC OBJECTIVE : Students are able to use root locus in some controller application
- B. SOFT SKILL COMPETENCY : Able to use MATLAB to check root locus performance on some of the controller kinds
- C. COURSE METHOD : Theoretical lectures, discussion
- D. MAIN COURSE DESCRIPTION : Root Locus
- E. SUB COURSE DESCRIPTION : Use root-locus to design control system, sample of phase lead controller, P, PI, PD and PID
- F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	15	Repeating briefly about root-locus method	Listening	LCD, Whiteboard
2	MAIN LECTURE	90	Teaching about application of root-locus to design control system, sample of phase lead controller, P, PI, PD and PID	Listening	LCD, Whiteboard
3	CONCLUSION	15	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations
- H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
 LECTURE : 10
- A. COURSE OBJECTIVES :
1. GENERAL OBJECTIVE : Students are able to understand response frequency analysis concept and bode plot on control system
  2. SPECIFIC OBJECTIVE : Students are able to understand the important of response frequency analysis
- B. SOFT SKILL COMPETENCY : Able to use MATLAB to make bode plot diagram
- C. COURSE METHOD : Theoretical lectures, discussion
- D. MAIN COURSE DESCRIPTION : Response frequency Analysis & Bode Plot
- E. SUB COURSE DESCRIPTION : Response Frequency, bode plot diagram, phenomena of time delay on physical system
- F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	15	Teaching briefly about application of bode plot	Listening	LCD, Whiteboard
2	MAIN LECTURE	90	Teaching about making first and second order bode plot sketch, using MATLAB to make bode plot, response frequency, bode plot diagram and phenomena modeling of time delay on bode plot	Listening	LCD, Whiteboard
3	CONCLUSION	15	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations
- H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
LECTURE : 11
- A. COURSE OBJECTIVES :
1. GENERAL OBJECTIVE : Students are able to understand response frequency analysis concept and bode plot on control system
  2. SPECIFIC OBJECTIVE : Students are able to use response frequency analysis for some controller
- B. SOFT SKILL COMPETENCY : Able to explain bode plot diagram that its relationship with controller response frequency
- C. COURSE METHOD : Theoretical lectures, discussion
- D. MAIN COURSE DESCRIPTION : Response Frequency Analysis & Bode Plot
- E. SUB COURSE DESCRIPTION : Correlation between bode plot with response system, modify response system with using bode plot, sample of phase lead controller, P, PI, PD, and PID
- F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	15	Teaching briefly about bode plot	Listening	LCD, Whiteboard
2	MAIN LECTURE	90	Teaching about correlation between bode plot with response system, modify response system with using bode plot, sample of phase lead controller, P, PI, PD and PID	Listening	LCD, Whiteboard
3	CONCLUSION	15	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations
- H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
LECTURE : 12
- A. COURSE OBJECTIVES :
1. GENERAL OBJECTIVE : Students are able to understand application of PID controller in engineering sector
  2. SPECIFIC OBJECTIVE : Students are able to understand one of the controller principle is PID controller
- B. SOFT SKILL COMPETENCY : Able to distinct kind of PID controller or its cluster
- C. COURSE METHOD : Theoretical lectures, discussion
- D. MAIN COURSE DESCRIPTION : PID Controller & Phase Lead Compensation
- E. SUB COURSE DESCRIPTION : PID Controller Design , PID Controller Design Analysis, PID, Implementation of PID Controller
- F. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Teaching briefly about kinds of controller	Listening	LCD, Whiteboard, Microcontroller kit
2	MAIN LECTURE	100	Teaching about PID controller include definition, PID controller design, PID controller design analysis and Implementation of PID controller in engineering sector	Listening	LCD, Whiteboard, Microcontroller kit
3	CONCLUSION	10	Conclusion, discussion and preview of next lecture	Listening and discussion	LCD, Whiteboard, Microcontroller kit

- G. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations
- H. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"

## STANDARD COURSE OUTLINE

### TKM 415 : CONTROL SYSTEMS (2 CREDITS)

- CLASS/LABORATORY SCHEDULE : One 120-minute lectures per week  
 LECTURE : 13  
 A. COURSE OBJECTIVES :  
     B. GENERAL OBJECTIVE : Students are able to understand application of phase lead in engineering sector
- I. SPECIFIC OBJECTIVE : Students are able to understand principle of phase lead compensation kind
- C. SOFT SKILL COMPETENCY : Able to distinct between phase lead and phase lag
- D. COURSE METHOD : Theoretical lectures, discussion
- E. MAIN COURSE DESCRIPTION : PID Controller & Phase Lead Compensation
- F. SUB COURSE DESCRIPTION : Phase Lead Controller Design, phase lead design analysis, kompensasi phase lead compensation
- G. COURSE ACTIVITY :

NO	PROGRESS	TIME (MINUTE)	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Repeating briefly about timer/counter	Listening	LCD, Whiteboard
2	MAIN LECTURE	100	Teaching about phase lead controller include definition, phase lead controller design, phase lead controller design analysis and Implementation of phase lead controller in engineering sector	Listening	LCD, Whiteboard
3	CONCLUSION	10	Discussion and Conclusion	Listening and discussion	LCD, Whiteboard

- H. METHODS OF ASSESSMENT : Graded presence, homework, graded examinations
- I. TEXTBOOK : "Feedback Control Systems", 4th Ed by Charles L. Phillips & Royce D. Harbor, Prentice Hall 2000"



6	Students will learn technical writing procedure of final project	Group assignment	Review Writing assignment	90	Presence, cases study, discussion	Students will able to use lcd, personal computer, microsoft word software, power point software, and able to writing of report	1,2,3,4
7	Students will learn technical writing procedure of final project	Group assignment	Review Writing assignment	90	Presence, cases study, discussion	Students will able to use lcd, personal computer, microsoft word software, power point software, and able to writing of report	1,2,3,4
8	Students will learn technical writing procedure of final project	Group assignment	Review Writing assignment	90	Presence, cases study, discussion	Students will able to use lcd, personal computer, microsoft word software, power point software, and able to writing of report	1,2,3,4
9	Student will learn type of presentaion and able to prepared	Presentation format, procedure and strategy	Types of presentations. Organizing presentations. Preparation and practice	90	Presence, cases study, discussion	Students will able to use lcd, personal computer, microsoft word software, power point software, and able to writing of report	1,2,3,4
10	Student are able to use supported communication and presentation equipment	Presentation format, procedure and strategy	Power Point and other tools for presentation	90	Presence, cases study, discussion	Students will able to use lcd, personal computer, microsoft word software, power point software, and able to writing of report	5, 6
11	Student are able to have presentation in class	Presentation format, procedure and strategy	During presentation. Handling questions and other concerns	90	Presence, cases study, discussion	Students will able to use lcd, personal computer, microsoft word software, power point software, and able to writing of report	5, 6
12	Student are able to have presentation in class	Group assignment	Presentation Evaluation	120	Presence, cases study, discussion	percaya diri dan mampu memberikan presentasi didepan audience	5, 6
13	Student are able to have presentation in class	Group assignment	Presentation Evaluation	120	Presence, cases study, discussion	percaya diri dan mampu memberikan presentasi didepan audience	5, 6
14	Student are able to have presentation in class	Group assignment	Presentation Evaluation	120	Presence, cases study, discussion	percaya diri dan mampu memberikan presentasi didepan audience	5, 6

## Reference

1. *Science Technical Writing: A manual of style* , Philip Rubens General Editor, Henry Holt Company, Ontario Canada, 1992.
2. *Writing for Science* , Robert Goldbort, Yale University Press, New Haven & London, 2006.
3. *Writing at University, A Guide for Students* , Phillis Crème and Mary R. Lea, 2nd ed., Open University Press, Maidenhead-Philadelphia, 2003.
4. *Kiat Jitu menyusun Skripsi* , Agnes Maria Polina dan Jong Jek Siang, Penerbit Andi, Yogyakarta, 2006.
5. *Boost Your Presentation IQ* , Marlyn Pincus, McGraw Hill, New York, 2006.
6. *Bullet Proof Presentations* , G. Michael Campbell, Caareer Press, Franklin Lakes, New Jersey, 2002

**TKM 421 : TECHNICAL WRITING AND PRESENTATION (2 CREDITS)**

**CLASS/LABORATORY SCHEDULE**

**LECTURE**

1

**A. COURSE OBJECTIVES**

1. GENERAL OBJECTIVES

Students will learn type of technical writing

2. SPECIFIC OBJECTIVE

Students will learn technical writing procedure of final project

**B. SOFT SKILL COMPETENCY :**

Students will able to find information related with thesis writing

**C. COURSE METHOD**

Presence, cases study, discussion, homework, literature search in internet and library

**D. MAIN COURSE DESCRIPTION**

Introduction

**E. SUB COURSE DESCRIPTION**

Type of technical writings and purposes. Helpful resources for preparing proposals and technical writings

**F. COURSE ACTIVITY**

NO	OVERVIEW	TIME ESTIMATE	CLASS ACTIVITY	STUDENT ACTIVITY	COURSE EQUIPMENT
1	INTRODUCTION	10	Syllabus	Listening	White board, lcd, laptop
2	MAIN LECTURE	70	Prologue	Listening	White board, lcd, laptop
3	CONCLUSION	10	Discussion	Discussion	White board, lcd, laptop

**G. METHODS OF ASSESSMENT :**

Graded homework assignments

**H. TEXTBOOK**

1. *Science Technical Writing: A manual of style* , Philip Rubens General Editor, Henry Holt Company, Ontario Canada, 1992.
2. *Writing for Science* , Robert Goldbort, Yale University Press, New Haven & London, 2006.
3. *Writing at University, A Guide for Students* , Phillis Crème and Mary R. Lea, 2nd ed., Open University Press, Maidenhead-Philadelphia, 2003.
4. *Kiat Jitu menyusun Skripsi* , Agnes Maria Polina dan Jong Jek Siang, Penerbit Andi, Yogyakarta, 2006.

**TKM 421 : TECHNICAL WRITING AND PRESENTATION (2 CREDITS)**

CLASS/LABORATORY SCHEDULE

LECTURE 2

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES

Student will learn format of technical writing document for undergraduate final project and graduation procedure  
Planning a Document's Content and Organizing the Document

2. SPECIFIC OBJECTIVE

Students will learn technical writing procedure of final project

B. SOFT SKILL COMPETENCY :

Students will able to use lcd, personal computer, microsoft word software, power point software, and able to writing of report

C. COURSE METHOD

Presence, cases study, discussion

D. MAIN COURSE DESCRIPTION

Writing format, procedure and strategy

E. SUB COURSE DESCRIPTION

Format of technical writing document for undergraduate final project and graduation procedures. Planning a Document's Content and Organizing the Document

F. COURSE ACTIVITY

NO	OVERVIEW	TIME ESTIMATE	CLASS ACTIVITY	STUDENT ACTIVITY	COURSE EQUIPMENT
1	INTRODUCTION	10	Prologue	Listening	White board, lcd, laptop
2	MAIN LECTURE	70	Discourse, discussion	Listening, discussion	White board, lcd, laptop
3	CONCLUSION	10	Discussion	Discussion	White board, lcd, laptop

G. METHODS OF ASSESSMENT :

Graded homework assignments

H. TEXTBOOK

1. *Science Technical Writing: A manual of style* , Philip Rubens General Editor, Henry Holt Company, Ontario Canada, 1992.
2. *Writing for Science* , Robert Goldbort, Yale University Press, New Haven & London, 2006.
3. *Writing at University, A Guide for Students* , Phillis Crème and Mary R. Lea, 2nd ed., Open University Press, Maidenhead-Philadelphia, 2003.
4. *Kiat Jitu menyusun Skripsi* , Agnes Maria Polina dan Jong Jek Siang, Penerbit Andi, Yogyakarta, 2006.

## TKM 421 : TECHNICAL WRITING AND PRESENTATION (2 CREDITS)

### CLASS/LABORATORY SCHEDULE

LECTURE

3

#### A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES

Students will able to write final project according to writing procedure

2. SPECIFIC OBJECTIVE

Students will learn technical writing procedure of final project

B. SOFT SKILL COMPETENCY :

Students will able to use lcd, personal computer, microsoft word software, power point software, and able to writing of report

C. COURSE METHOD

Presence, cases study, discussion

D. MAIN COURSE DESCRIPTION

Writing format, procedure and strategy

E. SUB COURSE DESCRIPTION

Front matters. Standard Physics Symbols and Units abbreviation. Making Quotations and References. Plagiarism

F. COURSE ACTIVITY

NO	OVERVIEW	TIME ESTIMATE	CLASS ACTIVITY	STUDENT ACTIVITY	COURSE EQUIPMENT
1	INTRODUCTION	10	Prologue	Listening	White board, lcd, laptop
2	MAIN LECTURE	70	Discourse, discussion	Listening, discussion	White board, lcd, laptop
3	CONCLUSION	10	Discussion	Discussion	White board, lcd, laptop

G. METHODS OF ASSESSMENT :

Graded homework assignments

H. TEXTBOOK

1. *Science Technical Writing: A manual of style*, Philip Rubens General Editor, Henry Holt Company, Ontario Canada, 1992.
2. *Writing for Science*, Robert Goldbort, Yale University Press, New Haven & London, 2006.
3. *Writing at University, A Guide for Students*, Phillis Crème and Mary R. Lea, 2nd ed., Open University Press, Maidenhead-Philadelphia, 2003.
4. *Kiat Jitu menyusun Skripsi*, Agnes Maria Polina dan Jong Jek Siang, Penerbit Andi, Yogyakarta, 2006.

**TKM 421 : TECHNICAL WRITING AND PRESENTATION (2 CREDITS)**

CLASS/LABORATORY SCHEDULE

LECTURE 4

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES

Students will able to write final project according to writing procedure

2. SPECIFIC OBJECTIVE

Students will learn technical writing procedure of final project

B. SOFT SKILL COMPETENCY :

Students will able to use lcd, personal computer, microsoft word software, power point software, and able to writing of report

C. COURSE METHOD

Presence, cases study, discussion

D. MAIN COURSE DESCRIPTION

Writing format, procedure and strategy

E. SUB COURSE DESCRIPTION

Creating Useful Data Display: Table, Chart, Diagram, Figure and Visual Methods

F. COURSE ACTIVITY

NO	OVERVIEW	TIME ESTIMATE	CLASS ACTIVITY	STUDENT ACTIVITY	COURSE EQUIPMENT
1	INTRODUCTION	10	Prologue	Listening	White board, lcd, laptop
2	MAIN LECTURE	70	Discourse, discussion	Listening, discussion	White board, lcd, laptop
3	CONCLUSION	10	Discussion	Discussion	White board, lcd, laptop

G. METHODS OF ASSESSMENT :

Graded homework assignments

H. TEXTBOOK

1. *Science Technical Writing: A manual of style* , Philip Rubens General Editor, Henry Holt Company, Ontario Canada, 1992.
2. *Writing for Science* , Robert Goldbort, Yale University Press, New Haven & London, 2006.
3. *Writing at University, A Guide for Students* , Phillis Crème and Mary R. Lea, 2nd ed., Open University Press, Maidenhead-Philadelphia, 2003.
4. *Kiat Jitu menyusun Skripsi* , Agnes Maria Polina dan Jong Jek Siang, Penerbit Andi, Yogyakarta, 2006.

**TKM 421 : TECHNICAL WRITING AND PRESENTATION (2 CREDITS)**

**CLASS/LABORATORY SCHEDULE**

**LECTURE** 5

**A. COURSE OBJECTIVES**

**1. GENERAL OBJECTIVES**

Students will able to write final project according to writing procedure

**2. SPECIFIC OBJECTIVE**

Students will learn technical writing procedure of final project

**B. SOFT SKILL COMPETENCY :**

Students will able to use lcd, personal computer, microsoft word software, power point software, and able to writing of report

**C. COURSE METHOD**

Presence, cases study, discussion

**D. MAIN COURSE DESCRIPTION**

Writing format, procedure and strategy

**E. SUB COURSE DESCRIPTION**

Solving Paragraph & Sentence Problem. Abstract and Conclusion. Common Pitfalls

**F. COURSE ACTIVITY**

NO	OVERVIEW	TIME ESTIMATE	CLASS ACTIVITY	STUDENT ACTIVITY	COURSE EQUIPMENT
1	INTRODUCTION	10	Prologue	Listening	White board, lcd, laptop
2	MAIN LECTURE	70	Discourse, discussion	Listening, discussion	White board, lcd, laptop
3	CONCLUSION	10	Discussion	Discussion	White board, lcd, laptop

**G. METHODS OF ASSESSMENT :**

Graded homework assignments

**H. TEXTBOOK**

1. *Science Technical Writing: A manual of style* , Philip Rubens General Editor, Henry Holt Company, Ontario Canada, 1992.
2. *Writing for Science* , Robert Goldbort, Yale University Press, New Haven & London, 2006.
3. *Writing at University, A Guide for Students* , Phillis Crème and Mary R. Lea, 2nd ed., Open University Press, Maidenhead-Philadelphia, 2003.
4. *Kiat Jitu menyusun Skripsi* , Agnes Maria Polina dan Jong Jek Siang, Penerbit Andi, Yogyakarta, 2006.

## TKM 421 : TECHNICAL WRITING AND PRESENTATION (2 CREDITS)

### CLASS/LABORATORY SCHEDULE

#### LECTURE

6,7,8

#### A. COURSE OBJECTIVES

##### 1. GENERAL OBJECTIVES

Students will able to write final project according to writing procedure

##### 2. SPECIFIC OBJECTIVE

Students will learn technical writing procedure of final project

#### B. SOFT SKILL COMPETENCY :

Students will able to use lcd, personal computer, microsoft word software, power point software, and able to writing of report

#### C. COURSE METHOD

Presence, cases study, discussion

#### D. MAIN COURSE DESCRIPTION

Group assignment

#### E. SUB COURSE DESCRIPTION

Review Writing assignment

#### F. COURSE ACTIVITY

NO	OVERVIEW	TIME ESTIMATE	CLASS ACTIVITY	STUDENT ACTIVITY	COURSE EQUIPMENT
1	INTRODUCTION	10	Prologue	Listening	White board, lcd, laptop
2	MAIN LECTURE	70	Listening, discussion	Presentation, discussion,	White board, lcd, laptop
3	CONCLUSION	10	Homeworks	Discussion	White board, lcd, laptop

#### G. METHODS OF ASSESSMENT :

Graded homework assignments

#### H. TEXTBOOK

1. *Science Technical Writing: A manual of style*, Philip Rubens General Editor, Henry Holt Company, Ontario Canada, 1992.
2. *Writing for Science*, Robert Goldbort, Yale University Press, New Haven & London, 2006.
3. *Writing at University, A Guide for Students*, Phillis Crème and Mary R. Lea, 2nd ed., Open University Press, Maidenhead-Philadelphia, 2003.
4. *Kiat Jitu menyusun Skripsi*, Agnes Maria Polina dan Jong Jek Siang, Penerbit Andi, Yogyakarta, 2006.

## TKM 421 : TECHNICAL WRITING AND PRESENTATION (2 CREDITS)

### CLASS/LABORATORY SCHEDULE

LECTURE

9

#### A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES

Students will learn type of technical writings

2. SPECIFIC OBJECTIVE

Student will learn type of presentaion and able to prepared

B. SOFT SKILL COMPETENCY :

Students will have confidence and presentation skill

C. COURSE METHOD

Presence, cases study, discussion

D. MAIN COURSE DESCRIPTION

Presentation format, procedure and strategy

E. SUB COURSE DESCRIPTION

Power Point and other tools for presentation

F. COURSE ACTIVITY

NO	OVERVIEW	TIME ESTIMATE	CLASS ACTIVITY	STUDENT ACTIVITY	COURSE EQUIPMENT
1	INTRODUCTION	10	Prologue	Listening	White board, lcd, laptop
2	MAIN LECTURE	70	Discourse, discussion	Listening, discussion	White board, lcd, laptop
3	CONCLUSION	10	Discussion	Discussion	White board, lcd, laptop

G. METHODS OF ASSESSMENT :

Graded homework assignments

H. TEXTBOOK

5. *Boost Your Presentation IQ*, Marlyn Pincus, McGraw Hill, New York, 2006.

6. *Bullet Proof Presentations*, G. Michael Campbell, Caareer Press, Franklin Lakes, New Jersey, 2002

**TKM 421 : TECHNICAL WRITING AND PRESENTATION (2 CREDITS)**

**CLASS/LABORATORY SCHEDULE**

LECTURE 10

**A. COURSE OBJECTIVES**

1. GENERAL OBJECTIVES

Students will learn type of technical writings

2. SPECIFIC OBJECTIVE

Student are able to use supported communication and presentation equipment

**B. SOFT SKILL COMPETENCY :**

Students will have confidence and presentation skill

**C. COURSE METHOD**

Presence, cases study, discussion

**D. MAIN COURSE DESCRIPTION**

Presentation format, procedure and strategy

**E. SUB COURSE DESCRIPTION**

During presentation. Handling questions and other concerns

**F. COURSE ACTIVITY**

NO	OVERVIEW	TIME ESTIMATE	CLASS ACTIVITY	STUDENT ACTIVITY	COURSE EQUIPMENT
1	INTRODUCTION	10	Prologue	Listening	White board, lcd, laptop
2	MAIN LECTURE	70	Discourse, discussion	Listening, discussion	White board, lcd, laptop
3	CONCLUSION	10	Discussion	Discussion	White board, lcd, laptop

**G. METHODS OF ASSESSMENT :**

Graded homework assignments

**H. TEXTBOOK**

5. *Boost Your Presentation IQ*, Marlyn Pincus, McGraw Hill, New York, 2006.

6. *Bullet Proof Presentations*, G. Michael Campbell, Caareer Press, Franklin Lakes, New Jersey, 2002

**TKM 421 : TECHNICAL WRITING AND PRESENTATION (2 CREDITS)**

CLASS/LABORATORY SCHEDULE

LECTURE 11

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES

Students will learn type of technical writings

2. SPECIFIC OBJECTIVE

Student are able to have presentation in class

B. SOFT SKILL COMPETENCY :

Students will have confidence and presentation skill

C. COURSE METHOD

Presence, cases study, discussion

D. MAIN COURSE DESCRIPTION

Presentation format, procedure and strategy

E. SUB COURSE DESCRIPTION

During presentation. Handling questions and other concerns

F. COURSE ACTIVITY

NO	OVERVIEW	TIME ESTIMATE	CLASS ACTIVITY	STUDENT ACTIVITY	COURSE EQUIPMENT
1	INTRODUCTION	10	Prologue	Listening	White board, lcd, laptop
2	MAIN LECTURE	70	Discourse, discussion	Listening, discussion	White board, lcd, laptop
3	CONCLUSION	10	Discussion	Discussion	White board, lcd, laptop

G. METHODS OF ASSESSMENT :

Graded homework assignments

H. TEXTBOOK

5. *Boost Your Presentation IQ*, Marlyn Pincus, McGraw Hill, New York, 2006.

6. *Bullet Proof Presentations*, G. Michael Campbell, Caareer Press, Franklin Lakes, New Jersey, 2002

## TKM 421 : TECHNICAL WRITING AND PRESENTATION (2 CREDITS)

### CLASS/LABORATORY SCHEDULE

#### LECTURE

12, 13, 14

#### A. COURSE OBJECTIVES

##### 1. GENERAL OBJECTIVES

Students will learn type of technical writings

##### 2. SPECIFIC OBJECTIVE

Student are able to have presentation in class

#### B. SOFT SKILL COMPETENCY :

Students will have confidence and presentation skill

#### C. COURSE METHOD

Presence, cases study, discussion

#### D. MAIN COURSE DESCRIPTION

Group assignment

#### E. SUB COURSE DESCRIPTION

Presentation Evaluation

#### F. COURSE ACTIVITY

NO	OVERVIEW	TIME ESTIMATE	CLASS ACTIVITY	STUDENT ACTIVITY	COURSE EQUIPMENT
1	INTRODUCTION	10	Prologue	Listening	White board, lcd, laptop
2	MAIN LECTURE	70	Discourse, discussion	Listening, discussion	White board, lcd, laptop
3	CONCLUSION	10	Discussion	Discussion	White board, lcd, laptop

#### G. METHODS OF ASSESSMENT :

Graded homework assignments

#### H. TEXTBOOK

5. *Boost Your Presentation IQ*, Marlyn Pincus, McGraw Hill, New York, 2006.

6. *Bullet Proof Presentations*, G. Michael Campbell, Caareer Press, Franklin Lakes, New Jersey, 2002



10		Process controllers	Terminology, PID tuning	90	Teoretical Lectures	Comunication skill and teamwork	1 & 2
11	Student will have knowledge application of controller	PLC systems	Hardware platform, interfacing, capabilities	90	Teoretical Lectures	Comunication skill and teamwork	1 & 2
12	Student will understand the benefit and application of PIC controller, student are able to analyze respone of closed loop feedback system	PID Controller	Choice of controllers, frequency response	90	Teoretical Lectures	Comunication skill and teamwork	3
13	Student will understand the benefit and application of PIC controller, student are able to analyze respone of closed loop feedback system	PID Controller	Efect of dead time, cascade control	90	Teoretical Lectures	Comunication skill and teamwork	4
14		Ujian akhir semester		90			

Reference

1. Mechatronics-Electronic Control Systems in Mechanical and Electrical Engineering, 2nd Ed., by W. Bolton. Addison Wesley Longman Ltd., 1999
2. Instrumentation and Control Systems, by W. Bolton, Elesevier 2004



#### H. TEXTBOOK

1. Mechatronics-Electronic Control Systems in Mechanical and Electrical Engineering,  
2nd Ed., by W. Bolton. Addison Wesley Longman Ltd., 1999
2. Instrumentation and Control Systems, by W. Bolton, Elsevier 2004



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