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**SATUAN ACARA PERKULIAHAN
(S A P)
(SUBJECT PROGRAM UNIT)**

**GARIS-GARIS BESAR PROGRAM
PENGAJARAN (GBPP)
(OUTLINE PROGRAM INSTRUCTION)**



**CHEMICAL ENGINEERING DEPARTMENT
FACULTY OF ENGINEERING DIPONEGORO UNIVERSITY**
Jl. Prof. Sudharto, SH, Tembalang, Semarang
Telp/Fax : (024) 7460058
E-mail : tkundip@telkomnet.id

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(SUBJECT PROGRAM UNIT)**

**GARIS-GARIS BESAR PROGRAM
PENGAJARAN (GBPP)
(OUTLINE PROGRAM INSTRUCTION)**

**INDUSTRIAL MANAGEMENT
(MANAJEMEN INDUSTRI)**



**CHEMICAL ENGINEERING DEPARTMENT
FACULTY OF ENGINEERING DIPONEGORO UNIVERSITY**
Jl. Prof. Sudharto, SH, Tembalang, Semarang
Telp/Fax : (024) 7460058
E-mail : tkundip@telkomnet.id

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
First meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Management Industrial subject

- Students are expected to describe the management basic concept and leadership.
- Students are expected to describe the similarity and the difference of leader management.
- Students are expected to loosen the characteristics of leadership.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, chapter leadership, students 4th semester are able to:

- Students can loosen the management basic principals in industries.
- Students can describe the differences and the management basic similarity and leadership.
- Students are expected to loosen the styles of classical leadership.
- Students are expected to loosen the characteristics of leadership.

B. MAIN CHAPTER : Leadership

C. SUB MAIN CHAPTER :

- The meaning of Leadership
- The similarity and the differences of leadership management
- The leadership theory

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lecturing matter in the first meeting, leadership 2. Describing the advantages of learning leadership 3. Describing the GIO and SIO, in the first meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
The serving	<ol style="list-style-type: none"> 1. Describing the leadership basic concept 2. Describing the functions of leadership in the industries or in a person 3. Describing the kinds of styles or characteristics of leadership 	> Taking care and various discussion	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFERENCES

Hani Handoko, T., 1985. *Manajemen Personalia dan Sumber Daya Manusia*. penerbit BPFE, Yogyakarta

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
Second Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Management Industrial subject

- Students are expected to describe the motivation theory.
- Students are expected to describe the uses of power in leadership.
- Students are expected to loosen the conflict theory.
- Students are expected to describe the theory of conflict management.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, chapter leadership and conflict management, students 4th semester are able to:

- Students are able to describe the implementation of leadership motivation.
- Students are able to loosen the advantages of leadership power.
- Students are able to describe the conflict theory in the management.
- Students are able to describe the problem of conflict management and the solution.

B. MAIN CHAPTER : Leadership and Conflict Management

C. SUB MAIN CHAPTER :

- The styles and the characteristics of leadership
- The meaning of conflict, conflict management, and some cases

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the second meeting 2. Describing the motivation theory and conflict in the management and also the applications. 3. Describing the GIO and SIO, in the second meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Describing the implementation of leadership motivation 2. Describing the functions of leadership power 3. Describing the conflict theory in management 4. Describing the problem of conflict management and the solution	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

1. Hani Handoko, T., 1985 . *Manajemen personalia dan Sumber daya manusia*, penerbit BPFE, Yogyakarta.
2. Diklat kuliah : Kepemimpinan (bahan bacaan/ajar).

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
Third Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Management Industrial subject

- Students are able to describe about stress management
- Students are able to describe about organization

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, chapter leadership and conflict management, students 4th semester are able to:

- Students are able to describe the theory of stress management
- Students are able to loosen the solution of stress management cases
- Students are able to describe the basics of organization
- Students are able to describe the scheme in the team working

B. MAIN CHAPTER : Stress Management and Organization

C. SUB MAIN CHAPTER :

- The meaning of stress management
- The theory and the examples of stress management cases
- The meaning of basic organization
- The purpose of organization
- The job division in the team work

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the third meeting 2. Describing the theory of stress management and organization 3. Describing the GIO and SIO. in the third meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Describing the theory of stress management and the solution of stress management cases 2. Describing the basics of organization and the purpose of organization 3. Describing the scheme of organization and the job division in the team work	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

1. Hani Handoko, T., 1985 . *Manajemen personalia dan Sumber daya manusia*, penerbit BPFE, Yogyakarta.
2. Diklat kuliah : Kepemimpinan (bahan bacaan/ajar).

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
Fourth Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Management Industrial subject

- Students are expected able to describe the decision making techniques and communication

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, chapter leadership and conflict management, students 4th semester are able to:

- explaining the purpose of decision making
- Using the techniques in the decision making process
- Describing the principal of communication basics
- Explaining and using the communication techniques

B. MAIN CHAPTER : The Techniques of Decision Making and Communication

C. SUB MAIN CHAPTER :

- The purpose of decision making
- the techniques of decision making process
- The basics of communication
- The techniques of communication and the example of the implementation

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the fourth meeting 2. Describing the basics of decision making and communication 3. Describing the GIO and SIO. in the fourth meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Describing the purpose of decision making 2. Explaining the techniques of decision making 3. Describing the scheme of organization and the job division in the team work	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFFERENCES

Hani Handoko, T., 1985. *Manajemen Personalia dan Sumber Daya Manusia*. Penerbit BPFE, Yogyakarta

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
Fifth Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Management Industrial subject.

- Students are expected able to explain the Human relation and rhetorical

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main chapter leadership and conflict management, students in the 4th semester are expected able to:

- Explaining the basics of human relation
- Explaining and describing the implementation of human relation Theory
- Describing the basics of rhetorical
- Describing the uses of rhetorical

B. MAIN CHAPTER : Human Relation and Rhetorical

C. SUB MAIN CHAPTER :

- The meaning of Human Relation (HR)
- Theory and implementation of HR
- The basics of rhetorical
- The uses of rhetorical

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the fifth meeting 2. Describing the basics of human relation and rhetorical 3. Describing the GIO and SIO, in the fifth meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Describing the meaning of human relation 2. Explaining the theory and the implementation of HR 3. Explaining the basics of rhetorical 4. Explaining the uses of rhetorical	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

Hani Handoko. T., 1985, *Manajemen Personalia dan Sumber Daya Manusia*, Penerbit BPFE, Yogyakarta.
 Text Book : Leadership (reading text)

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
Sixth Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Management Industrial subject.

- Students are expected able to calculate the time and the maximum cost in the networking planning program.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, the main chapter networking planning, students in the 4th semester are expected able to:

- Explaining the basics of networking planning
- Calculating Networking Planning project
- Describing and calculating NP problems vs cost aspect
- Calculating NP problems related with duration and maximum cost.

B. MAIN CHAPTER : Networking Planning

C. SUB MAIN CHAPTER :

- The basics of networking planning
- The implementation of NP in industries or project from the time aspect
- The implementation of NP seen from cost aspect
- The implementation of NP from the time and cost aspect

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	Describing the materials in the sixth meeting Describing the basics of network planning Describing the GIO and SIO. in the sixth meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	Calculating the problem of NP project (aspect of time) Explaining and calculating NP problems vs cost aspect Calculating NP problems related with duration and maximum cost.	> Taking care and various discussion	OHP, LCD, white board
Ending	Making a summary of the chapter which has been described Giving some questions	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

Hani Handoko. T.,1985. *Manajemen Personalia dan Sumber Daya Manusia*. Penerbit BPFE, Yogyakarta.
 Text Book : Leadership (reading text)

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TTK 344 / 2 SKS
Duration : 2 x 50 minutes
Seventh Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Management Industrial subject.

- Students are expected able to implement the fused quality management in industries.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, the main chapter, the fused quality management, students in the 4th semester are expected able to:

- Explaining the basic principal of fused quality management
- Explaining and describing the management of holds quality in industries
- Describing, implementing the service quality management
- Describing the differences of service and holds quality management

B. MAIN CHAPTER : Fused Quality Management

C. SUB MAIN CHAPTER :

- The fused quality management principal
- Holds quality management
- Service quality management
- The differences of holds and jasa management

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the seventh meeting 2. Describing the basics of fused quality management 3. Describing the GIO and SIO, in the seventh meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Explaining the holds quality management 2. Explaining the service quality management 3. Explaining the differences of holds and service management	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFFERENCES

Hani Handoko, T., 1985. *Manajemen Personalia dan Sumber Daya Manusia*. Penerbit BPFE, Yogyakarta.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
Eighth Meeting (Evaluation)

- I. Evaluation Matter** : 1st till 7th matter subject
- II. The Evaluation of Learning and Teaching Process** : Answering the list about learning and teaching process

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
Ninth Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

- At the end of learning process, students can explain the cash flow concept

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

- At the end of learning process, students can calculate the cash flow and serving it in scheme or table

B. MAIN CHAPTER : Cash Flow

C. SUB MAIN CHAPTER :

- The basic technique of decision making
- The definition of Cash Flow
- Calculating the cash flow

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the ninth meeting 2. Describing about the cost efficiency and profitability 3. Describing the GIO and SIO, in the ninth meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Describing about the basic technique of decision making 2. Explaining the basic concept of cash flow 3. Explaining the method of calculating the cash flow and also serving it in scheme or table.	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion > Doing the examination	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFFERENCES

1. Newman, D.G "Engineering Economy Analysis", second edition, Engineering Press Inc., California, 1983.
2. Thusen, G.J., and Fabrycky, "Engineering Economy Analysis ", sixth edition, Prentice-Hall, Inc., Englewood, 1983.
3. Ir. Abdullah. "Diktat Kuliah Managemen Industri", 2005.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TTK 344 / 2 SKS
Duration : 4 x 50 minutes
Tenth and Eleventh Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)
 - At the end of learning process, students can explain the basic concept of interest
2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)
 - At the end of learning process, students can use the formulas of interest in industrial problems

B. MAIN CHAPTER : Interest

C. SUB MAIN CHAPTER :

- The definition of Interest
- The formulas of Single Payment
- The formulas of Compound and Uniform Payment
- The formulas of Gradient Payment
- The nominal and effective interest

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the tenth and eleventh meeting 2. Describing about the cost efficiency and profitability 3. Describing the GIO and SIO. in the tenth and eleventh meeting	> Taking care and hearing.	OHP, LCD, white board
The serving	1. Describing about the basic technique of decision making 2. Explaining the basic concept of cash flow 3. Explaining the method of calculating the cash flow and also serving it in scheme or table.	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion > Doing examination	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

1. Newman, D.G "Engineering Economy Analysis". second edition. Engineering Press Inc., California, 1983.
2. Thusen, G.J., and Fabrycky, "Engineering Economy Analysis ". sixth edition. Prentice-Hall. Inc., Englewood, 1983.
3. Ir. Abdullah. "Diktat Kuliah Managemen Industri". 2005.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
Twelfth Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

- At the end of learning process, students can secure the choice of saving alternative that has been offered based on annually cash flow analysis

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

- At the end of learning process, students can choose one of the alternatives that is offered based on annually cash flow analysis and also secure the sensitivity of their decision.

B. MAIN CHAPTER : annual Cash Flow analysis and Sensitivity

C. SUB MAIN CHAPTER :

- The definition of annual cash flow analysis
- Calculating the cost and advantages of annual equivalent
- Analysis of annually cash flow
- Analysis period
- Sensitivity analysis

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the twelfth meeting 2. Describing about the cost efficiency and profitability 3. Describing the GIO and SIO. in the twelfth meeting	> Taking care and hearing.	OHP, LCD, white board
The serving	1. Describing the definition of annual cash flow analysis 2. Explaining the method of accounting the cost and advantages of annual equivalent 3. Giving the examples of annual cash flow analysis in industries 4. Describing annually cash flow analysis if there is the difference between the economical duration from an investation. 5. Describing the definition of sensitivity analysis and the application.	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion > Doing examination	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

1. Newman, D.G "Engineering Economy Analysis". second edition. Engineering Press Inc., California, 1983.
2. Thusen, G.J., and Fabrycky. "Engineering Economy Analysis ". sixth edition. Prentice-Hall, Inc., Englewood, 1983.
3. Ir. AbdulJah. "Diktat Kuliah Managemen Industri". 2005.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
Thirteenth Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

- At the end of learning process, students can secure the fixed of an investment

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

- At the end of learning process, students can calculate the Rate of Return from use the formulas of interest in industrial problems

B. MAIN CHAPTER : Rate Of Return Analysis

C. SUB MAIN CHAPTER : -

- The definition of ROR formula
- Calculating ROR
- Securing the fixed cost of an investment

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the thirteenth meeting 2. Describing about the profitability 3. Describing the GIO and SIO. in the thirteenth meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Describing the definition and ROR formulas 2. Explaining the method of calculating ROR of an investment 3. Securing the fixed cost of an investment.	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion > Doing examination	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

1. Newman, D.G "Engineering Economy Analysis". second edition. Engineering Press Inc., California, 1983.
2. Thusen, G.J., and Fabrycky, "Engineering Economy Analysis ". sixth edition, Prentice-Hall, Inc., Englewood, 1983.
3. Ir. Abdullah, "Diktat Kuliah Managemen Industri", 2005.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
14th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

- At the end of learning process, students can finish optimization problem where the objective function is linear

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

At the end of learning process, students are able to:

- Arranging mathematic model of linear optimization problem
- Calculating the minimum cost or maximum profit in production process

B. MAIN CHAPTER : Linear programming

C. SUB MAIN CHAPTER :

- The definition of Linear Programming (LP)
- Mathematic model of maximum and minimum problems
- Mathematic model of transportation problem
- The methods of completing the mathematics model

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the 14 th meeting 2. Describing the optimization problems 3. Describing the GIO and SIO. in the 14 th meeting	> Taking care and hearing.	OHP, LCD, white board
The serving	1. Explaining the arranging method of objective function and the limit of optimization problem 2. Explaining the arranging method of objective function and the limit of specific optimization problem 3. Explaining the methods of completing the mathematic similarity so the optimum yield can be obtained	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion > Doing examination	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

1. Studd, D.F., Watson, C.C. " Strategy of Process Engineering, " 1975
2. Meyer, R. R., 1975." Production and Management. " 1975.
3. Simarmata, D.A., " Operation Research : Sebuah Pengantar ". Penerbit PT. Gramedia Jakarta, 1982.
4. Ir. Abdullah, " Diktat Kuliah Management Industri ". 2005.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
15th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

- At the end of learning process, students can finish optimization problem where the objective function is linear

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

At the end of learning process, students are able to:

- Arranging mathematic model of optimization problem in stock control
- Calculating the minimum cost of stock control.
- Calculating the minimum cost of specific stock control.

B. MAIN CHAPTER : Stock Control

C. SUB MAIN CHAPTER :

- The definition of stock control
- The Cost Component of stock control
- Unlimited stock control
- Limited stock control
- Specific stock control

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the 15 th meeting 2. Describing the definition of stock control 3. Describing the GIO and SIO, in the 15 th meeting	> Taking care and hearing.	OHP, LCD, white board
The serving	1. Describing unlimited stock control 2. Explaining the limited stock control Explaining the definition of specific stock control	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions 3. Closing the end of learning activities	> Taking care and discussion > Doing examination	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFFERENCES

1. Meyer, R. R. 1975." Production and Management. " 1975.
2. Simarmata, D.A., " Operation Research : Sebuah Pengantar ", Penerbit PT. Gramedia Jakarta. 1982.
3. Ir. Abdullah. " Diktat Kuliah Management Industri ". 2005.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MANAGEMENT
Subject Code : TKK 344 / 2 SKS
Duration : 2 x 50 minutes
16th Meeting (Evaluation)

I. Evaluation Matter : 9th till 15th matter subject

II. The Evaluation of Learning and Teaching Process : Answering the list about learning and teaching process

LECTURING CONTRACT (PEDOMAN PERKULIAHAN MAHASISWA)

Subject Title : Industrial Management
Subject code : TKK 344 / 2 SKS
Lecturer : > Ir. H. Abdullah. M. S. Ph.D
> Luqman Buchori, ST, MT
The day/date of meeting : Friday / 2nd week / 4th Semester
The place of meeting : C.1.2 / C.2.1 Chemical Engineering

A. THE SUBJECT ADVANTAGES

Industrial management is very important. Basically, it manages the industries from the raw material supply, production, till the product storage and distribution. Some sources in industries are money, materials, or machine. It is needed some certain methods to look for the efficiency in managing that sources, so it can be achieved the optimum decision, by securing the minimum cost or maximum benefits. The basic provision for managing the human resources, money, etc, there is needed a sense about leadership, organization, team working, decision making, communication, network planning, span of control, thorough quality control, interest, analysis technique, linear program, and stock control of raw material. The collage students must be provisioned with knowledge and skill about industrial management, from the planning, actuating, controlling, and economic evaluation.

B. PROBLEM DESCRIPTION

Industrial Management Subject gives provision knowledge about : leadership (the definition, style, and characteristic, and also the function); organization and team working; decision making technique; conflict management; stress management; communication technique; network planning (cost aspect and searching the time's trade-off); span of control and also the fused quality control, interest, analysis technique, linear program, and stock control of raw material.

C. INSTRUCTIONAL OBJECTIVES

At the end of Industrial Management Subject, the students are expected to have ability and skill majoring :

1. Securing and understanding Industrial Management principals.
2. Securing and implementing organization and team working discussing about certain problems or team assignment.
3. Securing and calculating the Network Planning/CPM
4. Understanding the methods of gaining efficiency in a industrial process

D. LECTURING STRATEGY

The lecturing method by speech or discussion. So the students can do some exercise for example organization, communication, and team working. For that reason, the lecturer gives some team duties that discussing a certain problem. There are 4-7 persons each team. They will presentate their assignment in front of the class and the lecturer becomes the moderator.

E. LECTURING MATERY

The text book that will be used in lecturing activity:

1. Hani Handoko, T, "Manajemen Produksi dan Operasi", Penerbit BPFE, UGM, Yogyakarta, 1985.
2. Hani Handoko, T, "Manajemen Personalia dan Sumber Daya Manusia", Penerbit Liberty, Yogyakarta, 1990.
3. Kotler, P, "Manajemen Pemasaran, Analisis, Perencanaan, Implementasi dan Pengendalian", Penerbit Erlangga, 1992.
4. Winardi, Dr. Prof, "Manajemen Perilaku Organisasi", Penerbit PT, Citra Aditya Bakti, Bandung, 1992.
5. Rudd, D. F., Watson, C. C., "Strategy of Process Engineering", 1975.
6. Newman, D. G., "Engineering Economy Analysis", second edition, Engineering Press Inc., California, 1983.
7. Thusen, G. J., and Fabrycky, "Engineering Economy Analysis", sixth edition, Prantice-Hall, Inc, Englewood Cliffs, 1984.
8. Meyer, R. R, 1975 "Production ang Management", 1975.
9. Simarmata, D. A., "Operation Research: Sebuah Pengantar", Penerbit PT, Gramedia Jakarta, 1982.
10. Abdullah, "Diklat Kuliah Managemen Industri", 2005.

F. ASSIGNMENT

1. The lecturing activity is started according to meeting schedule. so the students are expected to read the text book first in the library.
2. Finishing the team assignment, 4-7 persons each team.
3. Mid semester or module will be held in the 7th or 8th meeting, and the last examination will be served in essay and arithmetic question.

G. EVALUATION CRITERIA

Here is the evaluation criteria in Industrial Management subject :

Mark	:	A	AB	B	BC	C	CD	D	E
Weight	:	4,0	3,5	3,0	2,5	2,0	1,5	1,0	0,0

The component that will be evaluated in the end of lecturing are :

1. Team assignment, given : 30%
2. Module, given : 70%
3. From that evaluation, point 1 and 2. if the minimum mark > 75 (B). the students will be free from the last evaluation.

H. LECTURING SCHEDULE

No.	week	Main Chapter	Sub Main Chapter	Reference
1.	1 st	Leadership Theory	1. The definition, the function of leadership 2. The style, characteristics of leadership	1, 2
2.	2 nd , 3 rd	Organization, Rhetorical, Motivation, Communication, Human Relation	1. Organization Structure of Company 2. The kinds of Organization 3. Communication Techr.ique 4. A. Maslaw Hierarki	1, 2
3.	4 th , 5 th	Conflict or stress management, decision making	1. Conflict management, the solution 2. Decision process	1, 2
4.	5 th , 6 th	Network planning	1. NP aspect of time 2. NP aspect of cost	1, 2
5.	6 th , 7 th	Thorough Management Quality	1. The definition of service quality 2. TQM Principal	1, 2
6.	8 th	1 st Evaluation		
7.	9 th	Cash Flow	1. Efficiency, cost, and profitability 2. The definition of Cash Flow 3. Calculating the cash flow	6, 7
8.	10 th , 11 th	interest	1. The definition and the formulas of interest 2. Calculating the interest rate, annual cost, present value and next value of an investation	6, 7
9.	11 th -12 th	Analysis technique	1. The analysis of annual cash flow 2. ROR analysis 3. Provision Analysis	6, 7
10.	13 th -14 th	Linier Program	1. The definition of Linear Program 2. Maximum problems 3. Minimum problems 4. Transportatation problems	5, 8
11.	14 th -15 th	Stock Control	1. The cost component of stock control 2. Stock control of One or more kinds of devices 3. Specific stock control	5, 8, and 9
12.	16 th	Second evaluation		

The lecturing activity is based on lecturing Activity Units schedule.

COURSE OUTLINE

Course Outline is a formula of instructional duty and the principals of industrial management subject. In the course outline, industrial management consist of some components. They are:

1. General Instructional Objectives at subject level
2. Specific Instructional Objectives at the main chapter level
3. Main chapter (division of subject)
4. Sub main chapter (division of main chapter)
5. Time estimation that is used for every main chapter
6. Reference

OUTLINE PROGRAM INSTRUCTION

Subject	: INDUSTRIAL MANAGEMENT (Lecturer Team : 16 times meeting)
Subject Code	: TKK. 334 / 2 SKS
Description	: Industrial Management Subject gives provision knowledge about : leadership (the definition, style, and characteristic, and also the function); organization and team working; decision making technique: conflict management; stress management; communication technique: network planning (cost aspect and searching the time's trade-off); span of control and also the fused quality control, interest, analysis technique, linear program, and stock control of raw material.
GIO	: After following industrial management subject, the students are expected able to do and have a leadership skills, organization, team working, and securing or choosing an investation that offered based on economy criteria.

No.	SIO	Main Chapter	Sub Main Chapter	Time Estimation	Reference
1.	If the students are given the leadership science, they will be able to explain the leadership concept.	leadership	The function and the style of leadership. The characteristic of leadership	100 minutes	Hani Handoko. T.,1985. <i>Manajemen Personalia dan Sumber Daya Manusia</i> . Penerbit BPF. Yogyakarta. Text Book : Leadership (reading text)
2.	If the students are given the organization, communication, motivation, human relation, rhetorical science, they will be able to explain that organization.	organization, communication, motivation, human relation, rhetorical science.	Organization Structure of Company. The kinds of Organization. Communication Technique. A. Maslaw Hierarki	100 minutes	Hani Handoko. T.,1985. <i>Manajemen Personalia dan Sumber Daya Manusia</i> . Penerbit BPF. Yogyakarta. Text book: organization, communication technique, human

					relation. rhetorical. motivation
3.	If the students are given the Conflict or stress management, decision making science, they will be able to explain that concepts and conflict solution, stress, and decision making process.	Conflict management, stress management. decision making	Conflict management and the solution, stress management and the influence factors, and decision making process.	100 minutes	Hani Handoko. T.,1985, <i>Manajemen Personalia dan Sumber Daya Manusia</i> . Penerbit BPFE, Yogyakarta. Text book: Conflict management, stress management. decision making
4.	If the students are given the network planning science. they will be able to arrange and calculate the cost and the time's trade-off	network planning	The definition of network planning. NP from aspect of time and NP from aspect of cost and looking for the trade-off of time and cost aspect	100 minutes	Newman, D. G., "Engineering Economy Analysis", second edition. Engineering Press Inc., California, 1983. Thusen, G. J., and Fabrycky. "Engineering Economy Analysis", sixth edition. Prantice-Hall, Inc. Englewood Cliffs. 1984
5.	If the students are given the thorough quality management science, they will be able to explain the TQM concept.	Thorough Quality management (TQM)	The definition of TQM. The principal of TQM Edward Deming and Philiph Crosby	100 minutes	Text Book : TQM
6.	The students can explain the cash flow concept	Cash Flow	The definition of Cash Flow Calculating the cash flow	100 minutes	Newman, D. G., "Engineering Economy Analysis", second edition, Engineering Press Inc., California, 1983. Thusen, G. J., and Fabrycky. "Engineering Economy Analysis", sixth edition, Prantice-Hall, Inc. Englewood Cliffs. 1984
7.	The students can explain the basic principals of	interest	The definition of interest. the single payment formulas,	100 minutes	Newman, D. G., "Engineering Economy

	interest formula		uniform series. and gradient		Analysis". second edition. Engineering Press Inc., California, 1983. Thusen, G. J., and Fabrycky, "Engineering Economy Analysis". sixth edition. Prantice-Hall, Inc. Englewood Cliffs. 1984
8.	The students can use the interest formulas in industrial process	interest	Calculating the interest rate, annual cost, and calculating the cost if there is a change	100 minutes	Newman, D. G., "Engineering Economy Analysis", second edition. Engineering Press Inc., California, 1983. Thusen, G. J., and Fabrycky. "Engineering Economy Analysis", sixth edition. Prantice-Hall, Inc. Englewood Cliffs. 1984
9.	The students can choose one alternative that is offered based on analysis of annual cash flow and secure the provision of their decision	Analysis technique	Calculating the cost and advantages of annual equivalent, choosing the alternatives based on economical criteria, securing the provision of decision if there is a change of the components at the object.	100 minutes	Newman, D. G., "Engineering Economy Analysis". second edition. Engineering Press Inc., California, 1983. Thusen, G. J., and Fabrycky. "Engineering Economy Analysis", sixth edition. Prantice-Hall, Inc. Englewood Cliffs. 1984
10.	The students can secure the profitability of an investation	Analysis technique	The definition and the formulas of ROR Calculating ROR Securing the fixed cost of an investation, and securing the profitability	100 minutes	Newman, D. G., "Engineering Economy Analysis". second edition. Engineering Press Inc., California, 1983. Thusen, G. J., and Fabrycky, "Engineering Economy

					Analysis", sixth edition. Prantice-Hall, Inc. Englewood Cliffs. 1984
11.	The students are able to calculate the minimum cost or maximum profit in production process	Linear program	<ul style="list-style-type: none"> •The definition of linear program •Arranging the mathematic model of maximum or minimum problems •Finishing a problem graphically 	100 minutes	Rudd. D. F., Watson. C. C., "Strategy of Process Engineering". 1975. Meyer. R. R. 1975 "Production ang Management", 1975.
12.	The students are able to calculate the total devices that are ordered by minimum cost	Stock control	<ul style="list-style-type: none"> •The components of ordered cost •Unlimited stock control •Limited stock control •Specific stock control 	100 minutes	Meyer. R. R. 1975 "Production ang Management", 1975. Simarmata, D. A., "Operation Research: Sebuah Pengantar", Penerbit PT. Gramedia Jakarta, 1982.

**SATUAN ACARA PERKULIAHAN (S A P)
(SUBJECT PROGRAM UNIT)**

**GARIS-GARIS BESAR PROGRAM
PENGAJARAN (GBPP)
(OUTLINE PROGRAM INSTRUCTION)**

**MATERIAL CHEMIST
(KIMIA BAHAN)**



**CHEMICAL ENGINEERING DEPARTMENT
FACULTY OF ENGINEERING DIPONEGORO UNIVERSITY**
Jl. Prof. Sudharto, SH, Tembalang, Semarang
Telp/Fax : (024) 7460058
E-mail : tkundip@telkomnet.id

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
First meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist. Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following material chemist, Students are expected realize and manage:

- Classification material solid according to characteristic.
- Characteristic of material chemist.

B. MAIN CHAPTER : Mark of material

C. SUB MAIN CHAPTER :

- The meaning and classification of material solid.
- Characteristic of mechanic material.

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lesson of material chemist. 2. Describing the advantages of learning material chemist in chemical engineering. 3. Describing the GIO and SIO, in the first meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
The services	<ol style="list-style-type: none"> 1. Describing the relevation material chemist with other object.(before and after) 2. Describing with giving example of classification material solid according to characteristic. 3. Describing the characteristic mechanic of material solid. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving a general description about the next object. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions 	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

1. Van Vlæk. H.L., "Element of Materials Science and Engineering" Addison - Wesley Publishing Company, 1985
2. Jacobs. J.A an Kilduff. T.A., "Engineering Material Technology". 1994
3. Manas Chanda, " Science of Engineering Material". vol 1-3. 1979
4. Smith. W.F., " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
Second meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist, Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, students are able to describe the context between characteristic of material with:

- Primary and secondary bound
- Atom distances

B. MAIN CHAPTER : Influence of composition to characteristic material.

C. SUB MAIN CHAPTER :

- Primary and secondary bound
- Atom distances.

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Remind the resume of the object at the previous meeting. 2. Giving student some questions for knowing the student's ability about matter.	> Taking care and hearing. > Asking the questions. > Answering the questions	OHP, LCD, white board
The services	1. Describing relation of Primary and secondary bound and characteristic material . 2. Describing relation of atom distances with characteristic material.	> Taking care and various discussion > Asking the questions	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described. 2. Giving some questions 3. Giving a general description about the next object	> Taking care and discussion > Asking the Questions	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFERENCES

1. Van Vlack, H.L.. "Element of Materials Science and Engineering" Addison - Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A.. "Engineering Material Technology". 1994
3. Manas Chanda. " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F.. " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
Third meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist. Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, student's are able to:

- Students are able to crystallization system
- Students are able to hexagonal and a bar of cubic
- Students are able to geometric, direction, and crystallization surface.

B. MAIN CHAPTER : Arrangement atom system in solid material.

C. SUB MAIN CHAPTER :

- Crystallization system
- A bar of cubic
- Geometric, direction, and crystallization surface

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Remind the resume of the object at the previous meeting 2. Giving student some questions for knowing the student's ability about matter. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. > Answering the questions 	OHP, LCD, white board
The services	<ol style="list-style-type: none"> 1. Describing the general crystallization system of material solid. 2. Describing specific a bar of crystal cubic and hexagonal. 3. Describing and giving an example geometric, direction, and crystallization surface 	<ul style="list-style-type: none"> > Taking care and various discussion > Asking questions. 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving a general description about the next object 	<ul style="list-style-type: none"> > Taking care and various discussion > Asking questions 	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFERENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology". 1994
3. Manas Chanda, " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F., " Principles of Material Science and Engineering", 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
Fourth meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist, Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject. students are able to:

- Imitation of the material solid.
- Solid matter
- Diffusion atom

B. MAIN CHAPTER : Arrangement atom system in solid material

C. SUB MAIN CHAPTER :

- Imitation of the material solid.
- Solid matter
- Diffusion atom
- Part border

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Remind the resume of the object at the previous meeting 2. Giving student some questions for knowing the student's ability about matter.	> Taking care and hearing. > Asking the questions. > Answering the questions	OHP, LCD, white board
The services	1. Explaining the imitation of material solid. 2. Explaining the solid matter. 3. Explaining the diffusion of atom	> Taking care and hearing > Asking the questions	OHP. LCD. white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving a general description about the next object	> Taking care and hearing > Asking questions	OHP. LCD. white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFERENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994
3. Manas Chanda, " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F., " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
Fifth meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist, Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, students are expected able to:

- Escort single phase
- Deformation and influence toward to characteristic solid material.

B. MAIN CHAPTER : Single phase metal

C. SUB MAIN CHAPTER :

- Escort single phase
- Deformation
- Metal characteristic witness plastic deformation
- Recrystallization.

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Remind the resume of the object at the previous meeting 2. Giving student some questions for knowing the student's ability about matter. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. > Answering the questions 	OHP, LCD, white board
The services	<ol style="list-style-type: none"> 1. Explaining the escort single phase 2. Explaining the deformation elastic or plastic and the influence toward of solid material. 	<ul style="list-style-type: none"> > Taking care and various discussion 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving a general description about the next object 	<ul style="list-style-type: none"> > Taking care and hearing > Asking questions 	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFFERENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994
3. Manas Chanda, " Science of Engineering Material". vol 1-3. 1979
4. Smith, W.F., " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
Sixth meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist, Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, students are expected able to:

- The qualitative relation, consist of limit power dissolved, phase diagram
- Calculating phase composition
- Describing phase name, characteristic carbon iron

B. MAIN CHAPTER : double phase metal

C. SUB MAIN CHAPTER :

- Diagram phase
- The qualitative relation phase
- Phase system carbon iron

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Remind the resume of the object at the previous meeting 2. Giving student some questions for knowing the student's ability about matter. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. > Answering the questions 	OHP, LCD, white board
The services	<ol style="list-style-type: none"> 1. Explaining the relation of qualitative phase from material solid include bound power dissolved and diagram phase. 2. Explaining how to calculate phase composition. 3. Explaining system metal carbon concern about name or characteristic. 	<ul style="list-style-type: none"> > Taking care and various discussion > Asking question 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general deception about the next object. 	<ul style="list-style-type: none"> > Taking care and hearing > Asking questions 	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFFERENCES

1. Van Vlack, H.L.. "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology". 1994
3. Manas Chanda, " Science of Engineering Material". vol 1-3. 1979
4. Smith, W.F., " Principles of Material Science and Engineering", 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TTK. 234 / 2 SKS
Duration : 2 x 50 minutes
Seventh meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist. Students are expected realize and manage of characteristic. structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, students are expected able to:

- Explaining the potential electrode
- Explaining reaction of cathode anode
- Cause of galvanic cell
- Subtract corrosion.

B. MAIN CHAPTER : Fused Quality Management

C. SUB MAIN CHAPTER :

- Explaining the electrical electrode
- Explaining the kind galvanic cell
- Control corrosion

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Remind the resume of the object at the previous meeting. 2. Giving student some questions for knowing the student's ability about matter. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. > Answering the questions 	OHP, LCD, white board
The services	<ol style="list-style-type: none"> 1. Explaining relation between potential electrodes with corrosion. 2. Explaining reaction cathode and anode. 3. Explaining cause from corrosion. 4. Explaining how to prohibited corrosion. 	<ul style="list-style-type: none"> > Taking care and hearing > Asking the questions. 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general deception about the next object. 	<ul style="list-style-type: none"> > Taking care and hearing > Asking questions 	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFERENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994
3. Manas Chanda, " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F., " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
Eight meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist, Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

To known level of students understanding.

B. MAIN CHAPTER : Module test 1

C. SUB MAIN CHAPTER : -

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Remind purpose from evaluation 2. Distribute questions and describing importing item.	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The services	supervise	> Taking care and hearing > Asking the questions.	OHP, LCD, white board
Ending	1. earmark if the time is unlimited.	> Taking care and hearing > Asking questions	OHP, LCD, white board

E. EVALUATION

Giving the answer outline for the question that was given

F. REFERENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994
3. Manas Chanda, " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F., " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
Ninth meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist, Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, students are expected able to:

- Explaining definition of polymer
- Describing and explaining the size of molecule polymer
- Describing and explaining polymer classification

B. MAIN CHAPTER : material polymer

C. SUB MAIN CHAPTER :

- Definition of polymer
- Size of molecule polymer
- Polymer classification

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the lesson of polymer 2. Describing the advantages of learning polymer 3. Describing the GIO and SIO. in the first meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The services	1. Explaining definition of polymer 2. Explaining Size of molecule polymer 3. Explaining Polymer classification	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving a general description about the next object.	> Taking care and hearing. > Asking the questions	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
Students can understand the subject that has been described.

F. REFERENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison - Wesley Publishing Company, 1985
2. Jacobs, J.A and Kilduff, T.A., "Engineering Material Technology", 1994
3. Manas Chanda, " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F., " Principles of Material Science and Engineering", 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
Tenth Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist, Students are expected realize and manage of characteristic. structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject. students are expected able to:

- Explaining stereoisomer on polymer
- Explaining chemical bound on polymer
- Explaining crystallize on polymer

B. MAIN CHAPTER : material polymer

C. SUB MAIN CHAPTER :

- stereoisomer on polymer
- chemical bound on polymer
- crystallize on polymer

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lesson of polymer 2. Describing the advantages of learning polymer 3. Describing the GIO and SIO. in the first meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
The services	<ol style="list-style-type: none"> 1. Explaining stereoisomer on polymer 2. Explaining chemical bound on polymer 3. Explaining crystallize on polymer 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving a general description about the next object. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions 	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFERRENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A.. "Engineering Material Technology". 1994
3. Manas Chanda. " Science of Engineering Material". vol 1-3. 1979
4. Smith, W.F., " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
Eleventh Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist. Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, students are expected able to:

- Explaining transition on polymer
- Explaining degradation on polymer
- Explaining deformation on polymer

B. MAIN CHAPTER : material polymer

C. SUB MAIN CHAPTER :

- transition on polymer
- degradation on polymer
- deformation on polymer

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lesson of polymer 2. Describing the advantages of learning polymer 3. Describing the GIO and SIO, in the first meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
The services	<ol style="list-style-type: none"> 1. Explaining transition on polymer 2. Explaining degradation on polymer 3. Explaining deformation on polymer 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving a general description about the next object. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions 	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFERRENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994
3. Manas Chanda, " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F., " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
Twelfth Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist, Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, students are expected able to:

- Explaining definition of ceramics
- Explaining structure of ceramics
- Explaining characteristics of ceramics

B. MAIN CHAPTER : material ceramics

C. SUB MAIN CHAPTER :

- definition of ceramics
- structure of ceramics
- characteristics of ceramics

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lesson of ceramics 2. Describing the advantages of learning ceramics 3. Describing the GIO and SIO. in the first meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
The services	<ol style="list-style-type: none"> 1. Explaining definition of ceramics 2. Explaining structure of ceramics 3. Explaining characteristics of ceramics 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving a general description about the next object. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions 	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFFERENCES

1. Van Vlack, H.L.. "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994
3. Manas Chanda. " Science of Engineering Material", vol 1-3. 1979
4. Smith, W.F.. " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
13th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist, Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, students are expected able to:

- Explaining and describing ceramics crystallize
- Explaining ceramics material process
- Explaining sintering process on ceramics

B. MAIN CHAPTER : material ceramics

C. SUB MAIN CHAPTER :

- Type of ceramics crystallize
- ceramics material process
- sintering process on ceramics

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lesson of ceramics 2. Describing the advantages of learning ceramics 3. Describing the GIO and SIO, in the first meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
The services	<ol style="list-style-type: none"> 1. Explaining crystal ceramics 2. Explaining ceramics material process 3. Explaining sintering process on ceramics 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving a general description about the next object. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions 	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFERENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994
3. Manas Chanda, " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F., " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
14th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist, Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, students are expected able to:

- Explaining definition of composite
- Describing and explaining the purpose for making material composite
- Describing and explaining component on composite
- Describing and explaining the purpose the type of fiber on composite

B. MAIN CHAPTER : material composite

C. SUB MAIN CHAPTER :

- definition of composite
- the purpose for making material composite
- component on composite
- the purpose the type of fiber on composite

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lesson of composite 2. Describing the advantages of learning composite 3. Describing the GIO and SIO. in the first meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
The services	<ol style="list-style-type: none"> 1. Explaining definition of composite 2. Describing and explaining the purpose for making material composite 3. Describing and explaining component on composite 4. Describing and explaining the purpose the type of fiber on composite 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving a general description about the next object. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions 	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood
 Students can understand the subject that has been described.

F. REFERENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994
3. Manas Chanda, " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F., " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
15th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist. Students are expected realize and manage of characteristic. structure. and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, students are expected able to:

- Describing and explaining the type of composite
- Explaining the making/fabrication of composite
- Describing and explaining the method of Fiber Reinforced Plastic process

B. MAIN CHAPTER : material composite

C. SUB MAIN CHAPTER :

- The type of composite
- the making/fabrication of composite
- the method of Fiber Reinforced Plastic process

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lesson of composite 2. Describing the advantages of learning composite 3. Describing the GIO and SIO, in the first meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
The services	<ol style="list-style-type: none"> 1. Describing and explaining the type of composite 2. Explaining the making/fabrication of composite 3. Describing and explaining the method of Fiber Reinforced Plastic process 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving a general description about the next object. 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions 	OHP, LCD, white board

E. EVALUATION

Giving some questions and group assignments to be discussed so it can be understood Students can understand the subject that has been described.

F. REFERENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology". 1994
3. Manas Chanda, " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F., " Principles of Material Science and Engineering". 1986

SUBJECT PROGRAM UNIT

Subject : Material Chemist
Subject Code : TKK. 234 / 2 SKS
Duration : 2 x 50 minutes
16th Meeting (second module test)

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following material chemist, Students are expected realize and manage of characteristic, structure, and use to incomparable of material kind to chemical industrial equipment.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

To known level of students understanding.

B. MAIN CHAPTER : Module test 2

C. SUB MAIN CHAPTER : -

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Remind purpose from evaluation 2. Distribute questions and describing importing item.	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The services	supervise	> Taking care and hearing > Asking the questions.	OHP, LCD, white board
Ending	I. earmark if the time is unlimited.	> Taking care and hearing > Asking questions	OHP, LCD, white board

E. EVALUATION

Giving the answer outline for the question that was given

F. REFERENCES

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison - Wesley Publishing Company, 1985
2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994
3. Manas Chanda, " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F., " Principles of Material Science and Engineering", 1986

**LECTURING CONTRACT
(PEDOMAN PERKULIAHAN MAHASISWA)**

Subject Title : Material Chemist
 Subject code : TKK. 234 / 2 SKS
 Lecturer : > Ir. Setia Budi Sasongko . DEA, Ph.D
 > Falch Setia Budi,ST.,MT.

THE SUBJECT ADVANTAGES

Material chemist include in groups basic subject with credit charge 2 SKS. By following this lecturing, hopefully students will know and understand the characteristic of solid, structure of solid, metal material, metal combines, double phase material, material polymer, material ceramics, and material composite. With good understanding, students can follow as well as the subject which need material chemist knowledge like designing process tools and mechanical unit operation.

PROBLEM DESCRIPTION

Material chemist Subject gives provision knowledge about : the characteristic of solid, structure of solid, metal material, metal combines, double phase material, material polymer, material ceramics, and material composite.

INSTRUCTIONAL OBJECTIVES

At the end of Material Chemist Subject, the students can understand the characteristic of solid, structure of solid, metal material, metal combines, double phase material, material polymer, material ceramics, and material composite.

LECTURING STRATEGY

Lecturing methods that has done include talkative and discussion with structure tasks that has been written and discusses in class.

LECTURING MATTER

No	Minggu ke-	Main Chapter	Sub-Main Chapter	References
1	2	3	4	5
1	1	Mark of material	<ul style="list-style-type: none"> ▪ The meaning and classification of material solid. ▪ Characteristic of mechanic material. 	1,3,4
2	2	Influence of composition to characteristic material	<ul style="list-style-type: none"> ▪ Primary and secondary bound ▪ Atom distances. 	1,3,4
3	3	Arrangement atom system in solid material	<ul style="list-style-type: none"> ▪ crystallization system ▪ a bar of cubic Atom distances. ▪ geometric, direction, and crystallization surface 	1,3,4
4	4	Arrangement atom system in solid material	<ul style="list-style-type: none"> ▪ Imitation of the material solid. ▪ Solid matter ▪ Diffusion atom 	1,3,4
5	5	Single phase metal	<ul style="list-style-type: none"> ▪ Escort single phase ▪ Deformation ▪ Metal characteristic witness plastic deformation ▪ Recrystallization. 	1,3,4
6	6	double phase metal	<ul style="list-style-type: none"> ▪ Diagram phase ▪ The qualitative relation phase ▪ Phase system carbon iron 	1,3,4
7	7	Fused Quality Management	<ul style="list-style-type: none"> ▪ Explaining the electrical electrode ▪ Explaining the kind galvanic cell ▪ Control corrosion 	1,3,4

8	8	1 st evaluation	Module test 1	
9	9	material polymer	<ul style="list-style-type: none"> ▪ Definition of polymer ▪ Size of molecule polymer ▪ Polymer classification 	1,2,3,4
10	10	material polymer	<ul style="list-style-type: none"> ▪ stereoisomer on polymer ▪ chemical bound on polymer ▪ crystallize on polymer 	1,2,3,4
11	11	material polymer	<ul style="list-style-type: none"> ▪ transition on polymer ▪ degradation on polymer ▪ deformation on polymer 	1,2,3,4
12	12	material ceramics	<ul style="list-style-type: none"> ▪ definition of ceramics ▪ structure of ceramics ▪ characteristics of ceramics 	1,2,3,4
13	13	material ceramics	<ul style="list-style-type: none"> ▪ Type of ceramics crystallize ▪ ceramics material process ▪ sintering process on ceramics 	1,2,3,4
14	14	material composite	<ul style="list-style-type: none"> ▪ The type of composite ▪ the making/fabrication of composite ▪ the method of Fiber Reinforced Plastic process 	1,2,3,4
15	15	material composite	<ul style="list-style-type: none"> ▪ The meaning and classification of material solid. ▪ Characteristic of mechanic material. 	1,2,3,4
16	16	2 nd evaluation	Module test 2	

Book that used for reference are:

1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985
2. Jacobs, J.A and Kilduff, T.A., "Engineering Material Technology", 1994
3. Manas Chanda, " Science of Engineering Material", vol 1-3, 1979
4. Smith, W.F., " Principles of Material Science and Engineering". 1986

MARKING CRITERIA/ EVALUATION:

Mark Integrity:

A	4.0
AB	3.5
B	3.0
BC	2.5
C	2.0
CD	1.5
D	1.0
E	0.0

The evaluation components are:

Presentation	:10%
Task/ Discussion	: 15%
Mid Semester Evaluation	: 25%
Last Semester Evaluation	: 50%

OUTLINE PROGRAM INSTRUCTION

SUBJECT TITLE : MATERIAL CHEMIST
LECTURE : POLIMER, CERAMICS, AND COMPOSIT
SUBJECT CODE : TIK 125/ 2 SKS
BRIEF DECRPTION : mechanical chemist include explaining the characteristic of solid, structure of solid, metal material, metal combines, double phase material, material polymer, material ceramics, and material composite.
GIO : After following material chemist. Students are expected realize and manage the characteristic of solid. structure of solid. metal material. metal combines. double phase material, material polymer. material ceramics. and material composite to incomparable of material kind to chemical industrial equipment.

No	SIO	Main Chapter	Sub-Main Chapter	Time	Reference
1	Explain and understanding : <ul style="list-style-type: none"> ▪ Classification material solid according to characteristic. ▪ Characteristic of material chemist. 	Mark of material	<ul style="list-style-type: none"> ▪ The meaning and classification of material solid. ▪ Characteristic of mechanic material. 	100 minutes	1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985 2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994 3. Manas Chanda. " Science of Engineering Material", vol 1-3, 1979 4. Smith, W.F., " Principles of Material Science and Engineering", 1986
2	Explain and understanding : <ul style="list-style-type: none"> ▪ Primary and secondary bound ▪ Atom distances 	Influence of composition to characteristic material.	<ul style="list-style-type: none"> ▪ Primary and secondary bound ▪ Atom distances 	100 minutes	1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985 2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994 3. Manas Chanda. " Science of Engineering Material", vol 1-3, 1979 4. Smith, W.F., " Principles of Material Science and Engineering", 1986
3	Explain and understanding : <ul style="list-style-type: none"> ▪ crystallization system ▪ hexagonal and a bar of 	Arrangement atom system in solid material	<ul style="list-style-type: none"> ▪ Crystallization system ▪ A bar of cubic ▪ Geometric. direction. and crystallization surface 	100 minutes	1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing

	<ul style="list-style-type: none"> ▪ cubic geometric, direction, and crystallization surface. 					<p>Company, 1985</p> <ol style="list-style-type: none"> 2. Jacobs, J.A and Kilduff, T.A., "Engineering Material Technology", 1994 3. Manas Chanda, "Science of Engineering Material". vol 1-3, 1979 4. Smith, W.F., "Principles of Material Science and Engineering", 1986
4	<p>Explain and understanding :</p> <ul style="list-style-type: none"> ▪ Imitation of the material solid. ▪ Solid matter ▪ Diffusion atom 	<p>Arrangement atom system in solid material</p>	<ul style="list-style-type: none"> ▪ Imitation of the material solid. ▪ Solid matter ▪ Diffusion atom ▪ Part border 	100 minutes	<ol style="list-style-type: none"> 1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985 2. Jacobs, J.A and Kilduff, T.A., "Engineering Material Technology", 1994 3. Manas Chanda, "Science of Engineering Material", vol 1-3, 1979 4. Smith, W.F., "Principles of Material Science and Engineering", 1986 	
5	<p>Explain and understanding :</p> <ul style="list-style-type: none"> ▪ Escort single phase ▪ Deformation and influence toward to characteristic solid material ▪ 	<p>Single phase metal</p>	<ul style="list-style-type: none"> ▪ Escort single phase ▪ Deformation ▪ Metal characteristic witness plastic deformation ▪ Recrystallization 	100 minutes	<ol style="list-style-type: none"> 1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985 2. Jacobs, J.A and Kilduff, T.A., "Engineering Material Technology", 1994 3. Manas Chanda, "Science of Engineering Material", vol 1-3, 1979 4. Smith, W.F., "Principles of Material Science and Engineering", 1986 	
6	<p>Explain and understanding :</p> <ul style="list-style-type: none"> ▪ The qualitative relation. consist of limit power dissolved. phase diagram ▪ Calculating phase 	<p>double phase metal</p>	<ul style="list-style-type: none"> ▪ Diagram phase ▪ The qualitative relation phase ▪ Phase system carbon iron 	100 minutes	<ol style="list-style-type: none"> 1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985 2. Jacobs, J.A and Kilduff, T.A., "Engineering 	

	<p>composition</p> <ul style="list-style-type: none"> ▪ Describing phase name, characteristic carbon iron 				<p>Material Technology”, 1994</p> <p>3. Manas Chanda, “ Science of Engineering Material”, vol 1-3, 1979</p> <p>4. Smith, W.F., “ Principles of Material Science and Engineering”, 1986</p>
7	<p>Explain and understanding</p> <ul style="list-style-type: none"> ▪ Explaining the potential electrode ▪ Explaining reaction of cathode anode ▪ Cause of galvanic cell ▪ Subtract corrosion. 	<p>Fused Quality Management</p>	<ul style="list-style-type: none"> ▪ Explaining the electrical electrode ▪ Explaining the kind galvanic cell ▪ Control corrosion 	100 minutes	<p>1. Van Vlack, H.L., “Element of Materials Science and Engineering” Addison – Wesley Publishing Company, 1985</p> <p>2. Jacobs, J.A an Kilduff, T.A., “Engineering Material Technology”, 1994</p> <p>3. Manas Chanda, “ Science of Engineering Material”, vol I-3, 1979</p> <p>4. Smith, W.F., “ Principles of Material Science and Engineering”, 1986</p>
8	<p>To known level of students understanding</p>	<p>Module test 1</p>		100 minutes	
9	<p>Explaining definition of polymer:</p> <ul style="list-style-type: none"> ▪ Describing and explaining the size of molecule polymer ▪ Describing and explaining polymer classification 	<p>material polymer</p>	<ul style="list-style-type: none"> ▪ Definition of polymer ▪ Size of molecule polymer ▪ Polymer classification 	100 minutes	<p>1. Van Vlack, H.L., “Element of Materials Science and Engineering” Addison – Wesley Publishing Company, 1985</p> <p>2. Jacobs, J.A an Kilduff, T.A., “Engineering Material Technology”, 1994</p> <p>3. Manas Chanda, “ Science of Engineering Material”, vol 1-3, 1979</p> <p>4. Smith, W.F., “ Principles of Material Science and Engineering”, 1986</p>
10	<ul style="list-style-type: none"> ▪ Explaining stereoisomer on polymer ▪ Explaining chemical bound on polymer ▪ Explaining crystallize on polymer 	<p>material polymer</p>	<ul style="list-style-type: none"> ▪ stereoisomer on polymer ▪ chemical bound on polymer ▪ crystallize on polymer 	100 minutes	<p>1. Van Vlack, H.L., “Element of Materials Science and Engineering” Addison – Wesley Publishing Company, 1985</p> <p>2. Jacobs, J.A an Kilduff, T.A., “Engineering Material Technology”,</p>

						<p>1994</p> <p>3. Manas Chanda, "Science of Engineering Material", vol 1-3, 1979</p> <p>4. Smith. W.F., "Principles of Material Science and Engineering", 1986</p>
11	<ul style="list-style-type: none"> ▪ Explaining transition on polymer ▪ Explaining degradation on polymer ▪ Explaining deformation on polymer 	material polymer	<ul style="list-style-type: none"> ▪ transition on polymer ▪ degradation on polymer ▪ deformation on polymer 	100 minutes	<ol style="list-style-type: none"> 1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985 2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994 3. Manas Chanda, "Science of Engineering Material", vol 1-3, 1979 4. Smith. W.F., "Principles of Material Science and Engineering", 1986 	
12	<ul style="list-style-type: none"> ▪ Explaining and describing ceramics crystallize ▪ Explaining ceramics material process ▪ Explaining sintering process on ceramics 	material ceramics	<ul style="list-style-type: none"> ▪ definition of ceramics ▪ structure of ceramics ▪ characteristics of ceramics 	100 minutes	<ol style="list-style-type: none"> 1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985 2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994 3. Manas Chanda, "Science of Engineering Material", vol 1-3, 1979 4. Smith. W.F., "Principles of Material Science and Engineering", 1986 	
13	<ul style="list-style-type: none"> ▪ Explaining and describing ceramics crystallize ▪ Explaining ceramics material process ▪ Explaining sintering process on ceramics 	material ceramics	<ul style="list-style-type: none"> ▪ Type of ceramics crystallize ▪ ceramics material process ▪ sintering process on ceramics 	100 minutes	<ol style="list-style-type: none"> 1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985 2. Jacobs, J.A an Kilduff, T.A., "Engineering Material Technology", 1994 3. Manas Chanda, "Science of 	

						Engineering Material", vol 1-3, 1979 4. Smith. W.F., "Principles of Material Science and Engineering", 1986
14	<ul style="list-style-type: none"> ▪ Explaining definition of composite ▪ Describing and explaining the purpose for making material composite ▪ Describing and explaining component on composite ▪ Describing and explaining the purpose the type of fiber on composite <ul style="list-style-type: none"> ○ 	material composite	<ul style="list-style-type: none"> ▪ definition of composite ▪ the purpose for making material composite ▪ component on composite ▪ the purpose the type of fiber on composite 	100 minutes		<ol style="list-style-type: none"> 1. Van Vlack, H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985 2. Jacobs. J.A an Kilduff, T.A., "Engineering Material Technology", 1994 3. Manas Chanda, "Science of Engineering Material", vol 1-3, 1979 4. Smith. W.F., "Principles of Material Science and Engineering", 1986
15	<ul style="list-style-type: none"> ▪ Describing and explaining the type of composite ▪ Explaining the making/fabrication of composite ▪ Describing and explaining the method of Fiber Reinforced Plastic process 	material composite	<ul style="list-style-type: none"> ▪ The type of composite ▪ the making/fabrication of composite ▪ the method of Fiber Reinforced Plastic process 	100 minutes		<ol style="list-style-type: none"> 1. Van Vlack. H.L., "Element of Materials Science and Engineering" Addison – Wesley Publishing Company, 1985 2. Jacobs. J.A an Kilduff, T.A., "Engineering Material Technology", 1994 3. Manas Chanda, "Science of Engineering Material", vol 1-3, 1979 4. Smith, W.F., "Principles of Material Science and Engineering". 1986
16	<ul style="list-style-type: none"> ▪ To know level of students understanding. 	Module test 2				

**SATUAN ACARA PERKULIAHAN (S A P)
(SUBJECT PROGRAM UNIT)**

**GARIS-GARIS BESAR PROGRAM
PENGAJARAN (GBPP)
(OUTLINE PROGRAM INSTRUCTION)**

**STATISTICS
(STATISTIK)**



**CHEMICAL ENGINEERING DEPARTMENT
FACULTY OF ENGINEERING DIPONEGORO UNIVERSITY**
Jl. Prof. Sudharto, SH, Tembalang, Semarang
Telp/Fax : (024) 7460058
E-mail : tkundip@telkomnet.id

SUBJECT PROGRAM UNIT

Subject : STATISTICS
Subject Code : TKK 242 / 2 SKS
Semester : 2
Duration : 100 minutes
First meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this subject, the students can explain the logical concept of modern statistics and also can use the statistics model as a basic of data analysis.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, chapter : The Definition and history of statistics and also the role in human living; the students can describe about the differences between the statistics and statistical. the kinds of statistics, and its parameter, and also the advantages in our living.

B. MAIN CHAPTER : The Definition and The history of statistics

C. SUB MAIN CHAPTER :

- Statistics and statistic
- The various kind of statistics
- The statistic's parameters
- The statistic's role in our living

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lecturing matter statistic. 2. Describing benefit lecturing basis statistic 3. Describing the GIO and SIO, in the first meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, white board
The serving	<ol style="list-style-type: none"> 1. Describing different between statistic and statistics 2. Describing the kind of statistic 3. Describing the role of statistic in life. 	> Taking care and various discussion	OHP, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general the next object. 	> Taking care and discussion	OHP, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

1. Dixon, W.J., "Introduction to Statistical Analysis" fourth edition. Mc Graw Hill. 1983.
2. Box, G. E. P., Hunter W.G., Hunter, J. S., "Statistics for Experimenters: An Introduction to Design, Data Analysis, and Model Building," John Wiley and Sons. 1978.
3. Sudjana, TB., "Metode Statistika". Penerbit Tarsito Bandung. 1986.
4. Supramono, "Pengantar Statistika", Percetakan Sata Wacana Semarang. 1990.

SUBJECT PROGRAM UNIT

Subject : STATISTICS
Subject Code : TKK 242 / 2 SKS
Semester : 2
Duration : 100 minutes
Second meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this subject, the students can explain the logical concept of modern statistics and also can use the statistics model as a basic of data analysis.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, chapter : Data, and central tendency and variants; the students can describe the meaning and the function of data, the students are able to explain the requirements of good data, able to explain the arrangement of accumulating and processing the data, able to describe the kind of data based on the characteristics, sources, and the way of obtaining the data, and also able to describe the serving types of data and he operation in uttering the central tendency and variants.

B. MAIN CHAPTER : Data and central tendency

C. SUB MAIN CHAPTER :

- The meaning and the function of data
- The Requirements of good data
- The arrangement of accumulating and processing data
- Describing the types of the data and serving data.
- The Mathematic operation in formulating central tendency and variants.

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lecturing of basic statistics 2. Describing the benefit of studying the statistics 3. Describing the GIO and SIO, in the second meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, white board
The serving	<ol style="list-style-type: none"> 1. Describing the meaning and the function of data 2. Describing the Requirements of good data 3. Describing the arrangement of accumulating and processing data 4. Describing the types of the data and serving data 5. The types of serving data. 6. The Mathematic operation in formulating central tendency and variants. 	> Taking care and various discussion	OHP, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general description about the next chapter 	> Taking care and discussion	OHP, white board

E. EVALUATION

Giving some questions being discussed in small group for knowing the students comprehension.

F. REFERENCES

1. Dixon, W.J., "Introduction to Statistical Analysis" fourth edition, Mc Graw Hill, 1983.
2. Box, G. E. P., Hunter W.G., Hunter, J. S., "Statistics for Experimenters: An Introduction to Design, Data Analysis, and Model Building, "John Wiley and Sons. 1978.
3. Sudjana, TB., "Metode Statistika", Penerbit Tarsito Bandung, 1986.
4. Supramono, "Pengantar Statistika", Percetakan Sata Wacana Semarang, 1990.

SUBJECT PROGRAM UNIT

Subject : STATISTICS
Subject Code : TKK 242 / 2 SKS
Semester : 2
Duration : 100 minutes
3rd meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this subject, the students can explain the logical concept of modern statistics and also can use the statistics model as a basic of data analysis.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main object, chapter : The Probability distribution; the students can describe about the definition of probability distribution, the function of probability distribution, and various kind of probability.

B. MAIN CHAPTER : The Probability distribution

C. SUB MAIN CHAPTER :

- the definition of probability distribution
- the function of probability distribution
- Various kind of probability distribution

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lecturing of data distribution 2. Describing the benefit of studying the probability distribution 3. Describing the GIO and SIO. in the third meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > discussion 	OHP, white board
The serving	<ol style="list-style-type: none"> 1. Describing the definition of probability distribution. 2. Describing the function of probability distribution 3. Describing the Various kind of probability distribution 	<ul style="list-style-type: none"> > Taking care and various discussion 	OHP, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general description about the next chapter. 	<ul style="list-style-type: none"> > Taking care and discussion 	OHP, white board

E. EVALUATION

Giving some questions being discussed in small group for knowing the students comprehension.

F. REFERENCES

1. Dixon, W.J., "Introduction to Statistical Analysis" fourth edition, Mc Graw Hill, 1983.
2. Sudjana, TB., "Metode Statistika", Penerbit Tarsito Bandung, 1986.
3. Supramono, "Pengantar Statistika", Percetakan Sata Wacana Semarang, 1990.

SUBJECT PROGRAM UNIT

Subject : STATISTICS
Subject Code : TKK 242 / 2 SKS
Semester : 2
Duration : 100 minutes
Fourth meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this subject, the students can explain the logical concept of modern statistics and also can use the statistics model as a basic of data analysis.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main object, chapter : The Normal distribution; the students can describe about the definition of normal distribution, the area under the normal curve, and checking the normal distribution.

B. MAIN CHAPTER : the Normal Distribution

C. SUB MAIN CHAPTER :

- The definition of normal distribution
- The similarity of normal distribution
- The area under the normal curve
- The checking the normal distribution

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lecturing of probability distribution 2. describing the Various kind of probability distribution 3. Describing the benefit of studying the normal distribution 	<ul style="list-style-type: none"> > Taking care and hearing. > discussion 	OHP, white board
The serving	<ol style="list-style-type: none"> 1. Describing the definition of normal distribution. 2. Describing the similarity of normal distribution 3. Describing the area under the normal curve 4. Describing the checking the normal distribution 	<ul style="list-style-type: none"> > Taking care and various discussion 	OHP, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general description about the next chapter. 	<ul style="list-style-type: none"> > Taking care and discussion 	OHP, white board

E. EVALUATION

Giving some questions being discussed in small group for knowing the students comprehension.

F. REFERENCES

1. Dixon, W.J., "Introduction to Statistical Analysis" fourth edition, Mc Graw Hill, 1983.
2. Sudjana, TB., "Metode Statistika", Penerbit Tarsito Bandung, 1986.
3. Supramono, "Pengantar Statistika". Percetakan Sata Wacana Semarang. 1990.

SUBJECT PROGRAM UNIT

Subject : STATISTICS
Subject Code : TKK 242 / 2 SKS
Semester : 2
Duration : 100 minutes
5th meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this subject, the students can explain the logical concept of modern statistics and also can use the statistics model as a basic of data analysis.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main object, chapter : The student distribution; the students can describe again about the definition of student distribution, the example of using the student distribution.

B. MAIN CHAPTER : The student distribution

C. SUB MAIN CHAPTER :

- The definition of student distribution
- The similarity of student distribution
- The procedure of understanding the t table
- The example of calculating t distribution

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the scope of student distribution 2. Describing the benefit of studying the student distribution 3. Describing the GIO and SIO, in the fifth meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > discussion 	OHP, white board
The serving	<ol style="list-style-type: none"> 1. Describing the definition of student distribution. 2. Describing the similarity of student distribution 3. Describing the procedure of understanding the t table 4. Describing the example of calculating t distribution 	<ul style="list-style-type: none"> > Taking care and various discussion 	OHP, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general description about the next chapter. 	<ul style="list-style-type: none"> > Taking care and discussion 	OHP, white board

E. EVALUATION

Giving some questions being discussed in small group for knowing the students comprehension.

F. REFERENCES

1. Dixon, W.J., "Introduction to Statistical Analysis" fourth edition, Mc Graw Hill, 1983.
2. Sudjana, TB., "Metode Statistika", Penerbit Tarsito Bandung, 1986.

SUBJECT PROGRAM UNIT

Subject : STATISTICS
Subject Code : TKK 242 / 2 SKS
Semester : 2
Duration : 100 minutes
6th meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this subject, the students can explain the logical concept of modern statistics and also can use the statistics model as a basic of data analysis.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main object. chapter : The Chi Square distribution; the students can describe again about the definition of Chi Square distribution, the example of using the Chi Square distribution.

B. MAIN CHAPTER : The Chi Square distribution

C. SUB MAIN CHAPTER :

- The definition of Chi Square distribution
- The similarity of Chi Square distribution
- The procedure of understanding the Chi table
- The example of calculating Chi Square distribution

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the scope of Chi Square distribution 2. Describing the benefit of studying the Chi Square distribution 3. Describing the GIO and SIO, in the 6th meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > discussion 	OHP, white board
The serving	<ol style="list-style-type: none"> 1. Describing the definition of Chi Square distribution. 2. Describing the similarity of Chi Square distribution 3. Describing the procedure of understanding the chi square table 4. Describing the example of calculating chi square distribution 	<ul style="list-style-type: none"> > Taking care and various discussion 	OHP, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general description about the next chapter. 	<ul style="list-style-type: none"> > Taking care and discussion 	OHP, white board

E. EVALUATION

Giving some questions being discussed in small group for knowing the students comprehension.

F. REFERENCES

1. Dixon, W.J., "Introduction to Statistical Analysis" fourth edition, Mc Graw Hill, 1983.
2. Sudjana, TB., "Metode Statistika", Penerbit Tarsito Bandung, 1986.

SUBJECT PROGRAM UNIT

Subject : STATISTICS
Subject Code : TKK 242 / 2 SKS
Semester : 2
Duration : 100 minutes
7th meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this subject, the students can explain the logical concept of modern statistics and also can use the statistics model as a basic of data analysis.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main object, chapter : The F distribution; the students can describe again about the definition of F distribution, the example of using the F distribution.

B. MAIN CHAPTER : The F distribution

C. SUB MAIN CHAPTER :

- The definition of F distribution
- The similarity of F distribution
- The procedure of understanding the F table
- The example of calculating F distribution

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the scope of F distribution 2. Describing the benefit of studying the F distribution 3. Describing the GIO and SIO, in the 7th meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > discussion 	OHP, white board
The serving	<ol style="list-style-type: none"> 1. Describing the definition of F distribution. 2. Describing the similarity of F distribution 3. Describing the procedure of understanding the F table 4. Describing the example of calculating F distribution 	<ul style="list-style-type: none"> > Taking care and various discussion 	OHP, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general description about the next chapter. 	<ul style="list-style-type: none"> > Taking care and discussion 	OHP, white board

E. EVALUATION

Giving some questions being discussed in small group for knowing the students comprehension.

F. REFERENCES

1. Dixon, W.J., "Introduction to Statistical Analysis" fourth edition, Mc Graw Hill, 1983.
2. Sudjana, TB., "Metode Statistika", Penerbit Tarsito Bandung, 1986.

SUBJECT PROGRAM UNIT

Subject : STATISTICS
Subject Code : TKK 242 / 2 SKS
Semester : 2
Duration : 100 minutes
8th meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this subject, the students can explain the logical concept of modern statistics and also can use the statistics model as a basic of data analysis.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

The students are expected to describe the various kind of hypothesis testing, the steps of hypothesis testing, and able to do the μ testing from one side or two sides and testing the similarity of two averages.

B. MAIN CHAPTER : The hypothesis testing

C. SUB MAIN CHAPTER :

- The various kind of hypothesis testing
- The steps of hypothesis testing
- the μ testing from one side or two sides
- testing the similarity of two averages.

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the definition of hypothesis testing and hypothesis 2. Explaining the parameters that is used in hypothesis testing 3. Describing the GIO and SIO, in the 8th meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > discussion 	OHP, white board
The serving	<ol style="list-style-type: none"> 1. Explaining the hypothesis concept. 2. Describing the definition of hypothesis testing 3. Describing the steps of hypothesis testing 4. Describing the μ testing from one side or two sides 5. Testing the similarity of two averages 	<ul style="list-style-type: none"> > Taking care and various discussion 	OHP, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general description about the next chapter. 	<ul style="list-style-type: none"> > Taking care and discussion 	OHP, white board

E. EVALUATION

Giving some questions being discussed in small group for knowing the students comprehension.

F. REFFERENCES

1. Dixon, W.J., "Introduction to Statistical Analysis" fourth edition, Mc Graw Hill, 1983.
2. Sudjana, TB., "Metode Statistika", Penerbit Tarsito Bandung, 1986.

SUBJECT PROGRAM UNIT

Subject : STATISTICS
Subject Code : TKK 242 / 2 SKS
Semester : 2
Duration : 100 minutes
9th meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this subject, the students can explain the logical concept of modern statistics and also can use the statistics model as a basic of data analysis.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

The students are expected to explain the variation testing (σ^2) from one side or two sides

B. MAIN CHAPTER : The hypothesis testing

C. SUB MAIN CHAPTER :

- The definition of hypothesis testing
- the variants testing (σ^2) from one side
- the variants testing (σ^2) from two sides
- The example of variants testing

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the various kind of hypothesis 2. Describing the parameters that is used in the variants testing 3. Describing the GIO and SIO, in the 9th meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > discussion 	OHP, white board
The serving	<ol style="list-style-type: none"> 1. Describing the definition of hypothesis testing 2. Describing the variants testing (σ^2) from one side 3. Describing the variants testing (σ^2) from two sides 4. Describing The example of variants testing 	<ul style="list-style-type: none"> > Taking care and various discussion 	OHP, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general description about the next chapter. 	<ul style="list-style-type: none"> > Taking care and discussion 	OHP, white board

E. EVALUATION

Giving some questions being discussed in small group for knowing the students comprehension.

F. REFERENCES

1. Dixon, W.J., "Introduction to Statistical Analysis" fourth edition. Mc Graw Hill, 1983.
2. Sudjana, TB., "Metode Statistika". Penerbit Tarsito Bandung, 1986.

SUBJECT PROGRAM UNIT

Subject : STATISTICS
Subject Code : TKK 242 / 2 SKS
Semester : 2
Duration : 100 minutes
10th meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this subject, the students can explain the logical concept of modern statistics and also can use the statistics model as a basic of data analysis.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main object. chapter : The Simple Linier Regression: the students can describe the parameter estimation in Simple Linier Regression method, the students are able to applicate and describe the free hand method in Simple Linier Regression, and able to applicate and describe the least square method in Simple Linier Regression, and also explain the simple regression testing.

B. MAIN CHAPTER : The Simple Regression Testing

C. SUB MAIN CHAPTER :

- Estimating the parameters in the Simple Linier Regression method
- Free hand method in Simple Linier Regression,
- the least square method in Simple Linier Regression
- the simple regression testing

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the scope of the Simple Linier Regression Describing the benefit of studying the Simple Linier Regression 2. Describing the GIO and SIO, in the 10th meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > discussion 	OHP, white board
The serving	<ol style="list-style-type: none"> 1. the students can explain in estimating the parameters of the Simple Linier Regression method. 2. the students can explain free hand method in Simple Linier Regression. 3. the students can explain and applicate the least square method in Simple Linier Regression 4. the students can explain the simple regression testing 	> Taking care and various discussion	OHP, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 3. Giving general description about the next chapter. 	> Taking care and discussion	OHP, white board

E. EVALUATION

Giving some questions being discussed in small group for knowing the students comprehension.

F. REFERENCES

1. Box, G. E. P., Hunter W.G., Hunter. J. S., "Statistics for Experimenters: An Introduction to Design, Data Analysis, and Model Building." John Wiley and Sons. 1978.
2. Dixon, W.J., "Introduction to Statistical Analysis" fourth edition, Mc Graw Hill. 1983.
3. Sudjana, TB., "Metode Statistika", Penerbit Tarsito Bandung. 1986.

**SATUAN ACARA PERKULIAHAN (S A P)
(SUBJECT PROGRAM UNIT)**

**GARIS-GARIS BESAR PROGRAM
PENGAJARAN (GBPP)
(OUTLINE PROGRAM INSTRUCTION)**

**ENVIRONMENTAL SCIENCE
(ILMU LINGKUNGAN)**



**CHEMICAL ENGINEERING DEPARTMENT
FACULTY OF ENGINEERING DIPONEGORO UNIVERSITY**
Jl. Prof. Sudharto, SH, Tembalang, Semarang
Telp/Fax : (024) 7460058
E-mail : tkundip@telkomnet.id

SUBJECT PROGRAM UNIT

Subject : Environmental Science
Subject Code : TKK 239
SKS : 2
Duration : 4 x 50 minutes
Meeting : 1 and 2

A. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this lecture in the 1st and 2nd meeting, students can understand environmental basic concept

B. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

1. Students can explain the meaning of ecology, ecosystem, and ecosystem role to support the living
2. Students can explain the meaning of production and decomposition
3. Students can explain the meaning of limit factor

C. MAIN CHAPTER : Basic of Ecology

D. SUB MAIN CHAPTER :

- a. The meaning of ecology and ecosystem
- b. The role of ecology for the living
- c. Production and ecosystem in ecosystem
- d. Limit factor and connection with environment standard quality

E. EVALUATION

Instrument that was used is checking for students verbal answer about the questions that was given about sub main capture a until d and individual task that was given

F. REFERENCES

1. Odum E.P., 1971, Fundamental of Ecology, 3rd edition, W.B. Saunders Company, Philadelphia

SUBJECT PROGRAM UNIT

Subject : Environmental Science
Subject Code : TKK 239
SKS : 2
Duration : 4 x 50 minutes
Meeting : 3 and 4

A. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this lecture in the 3rd and 4th meeting, students can understand water environmental pollution especially causes and aftermath

B. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

1. Students can explain the meaning of water pollution
2. Students can explain the source and characteristic of water pollution
3. Students can know the result from water pollution

C. MAIN CHAPTER : Water Pollution

D. SUB MAIN CHAPTER :

- a. The meaning of water pollution
- b. The source of pollution
- c. Characteristic of pollutant
- d. The effects of pollutant for human
- e. The effects of pollutant for biota

E. EVALUATION

Instrument that was used is checking for students verbal answer about the questions that was given about the matter that was given

F. REFERENCES

1. Anil Kumar De, 1987, *Environmental Chemistry*, Wiley Eastern Limited, New Delhi
2. Sawyer C.N. Mc. Carty P.L., 1978, *Chemistry for Environmental Engineering*, 3rd edition, Mc Graw Hill Kogakusha, Ltd, Tokyo
3. Waite T.D., 1984, *Principles of Water Quality*, Academic Press, Inc, London

SUBJECT PROGRAM UNIT

Subject	: Environmental Science
Subject Code	: TKK 239
SKS	: 2
Duration	: 4 x 50 minutes
Meeting	: 5 and 6

A. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this lecture in the 5th and 6th meeting, students can understand air environmental pollution especially causes and aftermath

B. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

1. Students can explain the meaning of air pollution
2. Students can explain the source and characteristic of air pollution
3. Students can know the result from water pollution

C. MAIN CHAPTER : Air Pollution

D. SUB MAIN CHAPTER :

- a. The meaning of air pollution
- b. The source of pollution
- c. Characteristic of pollutant
- d. The effects of pollutant for human
- e. The effects of pollutant for vegetation

E. EVALUATION

Instrument that was used is checking for student's verbal answer about the questions that was given about the matter that was given, that is activated sludge system with various sub main chapter.

F. REFERENCES

1. Stern A.C., 1977, Air Pollution: The Effect of Air Pollution, 3rd edition, Volume II Academic Press, New York.

SUBJECT PROGRAM UNIT

Subject	: Environmental Science
Subject Code	: TKK 239
SKS	: 2
Duration	: 2 x 50 minutes
Meeting	: 7

A. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this lecture in the 7th meeting, students can understand waste minimization

B. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

1. Students can explain the meaning of waste minimization
2. Students can explain waste minimization methods
3. Students can explain the economical and environmental benefit using waste minimization

C. MAIN CHAPTER : Waste Minimization

D. SUB MAIN CHAPTER :

- a. The meaning of waste minimization and clean production
- b. 3 R principal (reduce, recycle, recovery)
- c. Usage of waste minimization

E. EVALUATION

Instrument that was used is checking for student's verbal answer about the questions that was given about the matter that was given, that is activated sludge system with various sub main chapter.

F. REFERENCES

1. Bishop, 1989, Pollution Prevention, Academic Press, New York.

SUBJECT PROGRAM UNIT

Subject : Environmental Science
Subject Code : TKK 239
SKS : 2
Duration : 2 x 50 minutes
Meeting : 8 (evaluation)

1. Evaluation Matter : Lecturing Matter
2. Teaching-Learning Evaluation Process : Answer the list of question about ecology basics, air and water pollution, waste minimization

SUBJECT PROGRAM UNIT

Subject : Environmental Science
Subject Code : TKK 239
SKS : 2
Duration : 4 x 50 minutes
Meeting : 9 and 10

A. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this lecture in the 9th and 10th meeting, students can understand analytical concept about environmental living system

B. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

1. Students can explain the concept of environmental living system
2. Students can explain water environmental living system
3. Students can explain air environmental living system

C. MAIN CHAPTER : Analytical Environmental Living System

D. SUB MAIN CHAPTER :

- a. The meaning, usage of Analytical environmental living system
- b. Mixing Zone Model and Streeter-Phelp Model
- c. Box Model and Gaussian Model

E. EVALUATION

Instrument that was used is checking for student's verbal answer about the questions that was given about the matter that was given.

F. REFERENCES

1. Schoor J.L., 1996, Environmental Modeling: Fate and Transport of Pollutants in water, Air and Soil, John Wiley & Sons New York

SUBJECT PROGRAM UNIT

Subject : Environmental Science
Subject Code : TKK 239
SKS : 2
Duration : 4 x 50 minutes
Meeting : 1 and 12

A. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this lecture in the 11th and 12th meeting, students can understand technical control of water pollution

B. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

1. Students can explain basic principal of water pollution controller
2. Students can explain principal of manufacturing biological liquid waste
3. Students can explain basic principal of manufacturing physics and chemical liquid waste

C. MAIN CHAPTER : Water Pollution Controller

D. SUB MAIN CHAPTER :

- a. Waste characteristics
- b. Bioremediation and Fitoremediation
- c. Physical manufacturing waste process
- d. Chemical manufacturing waste process
- e. Biological manufacturing waste process

E. EVALUATION

Instrument that was used is checking for students verbal answer about the questions that was given about sub main capture a until d and individual task that was given

F. REFERENCES

1. Eckenfelder, W.W.Jr, Industrial Waste Pollution Control, Mc Graw Hill, New York
2. Springer A.M, 1986, Industrial Environmental Control, A Wiley Interscience Publication, John Wiley & Sons New York
3. Metcalf & Eddy, Wastewater Engineering, Treatment, Disposal, Reuse, third edition, Mc Graw Hill International Editions, Engineering Series
4. Reynolds, T.D., Unit Operations and Processes in Environmental Engineering, Brooks/Cole Engineering Division, Monterey, California

SUBJECT PROGRAM UNIT

Subject : Environmental Science
Subject Code : TKK 239
SKS : 2
Duration : 6 x 50 minutes
Meeting : 13, 14 and 15

A. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following this lecture in the 13th, 14th and 15th meeting, students can understand technical control of air pollution

B. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

1. Students can explain basic principal of air pollution controller
2. Students can explain principal of manufacturing gas pollution
3. Students can explain basic principal of manufacturing particulate pollution

C. MAIN CHAPTER : Air Pollution Controller

D. SUB MAIN CHAPTER :

- a. Absorber
- b. Adsorber
- c. Cyclone Separator
- d. Electrostatic Precipitation

E. EVALUATION

Instrument that was used is checking for students verbal answer about the questions that was given about sub main capture a until d and individual task that was given

F. REFERENCES

1. Stern A.C., Air Pollution: Engineering Control Of Air Pollution, 3rd edition, Volume IV Academic Press, New York

SUBJECT PROGRAM UNIT

Subject : Environmental Science
Subject Code : TKK 239
SKS : 2
Duration : 2 x 50 minutes
Meeting : 16

1. Evaluation Matter : Lecturing Matter
2. Teaching-Learning Evaluation Process : Answer the list of questions about analytical system, controlling water and air pollution

REFERENCE

1. Anil Kumar De, 1987, *Environmental Chemistry*, Wiley Eastern Limited, New Delhi
2. Bishop, 1989, *Pollution Prevention*, Academic Press, New York.
3. Eckenfelder, W.W.Jr, *Industrial Waste Pollution Control*, Mc Graw Hill, New York
4. Metcalf & Eddy, *Wastewater Engineering, Treatment, Disposal, Reuse*, third edition,
5. Reynolds, T.D., *Unit Operations and Processes in Environmental Engineering*, Brooks/Cole Engineering Division, Monterey, California
6. Odum E.P., 1971, *Fundamental of Ecology*, 3rd edition, W.B. Saunders Company, Philadelphia
7. Sawyer C.N. Mc. Carty P.L., 1978, *Chemistry for Environmental Engineering*, 3rd edition, Mc Graw Hill Kogakusha, Ltd, Tokyo
8. Schorr J.L., 1996, *Environmental Modeling: Fate and Transport of Pollutants in water, Air and Soil*, John Wiley & Sons New York
9. Springer A.M, 1986, *Industrial Environmental Control*, A Wiley Interscience Publication, John Wiley & Sons New York
10. Stern A.C., 1977, *Air Pollution: The Effect of Air Pollution*, 3rd edition, Volume II Academic Press, New York.
11. Stern A.C., *Air Pollution: Engineering Control Of Air Pollution*, 3rd edition, Volume IV Academic Press, New York
12. Waite T.D., 1984, *Principles of Water Quality*, Academic Press, Inc, London

**SATUAN ACARA PERKULIAHAN (S A P)
(SUBJECT PROGRAM UNIT)**

**GARIS-GARIS BESAR PROGRAM
PENGAJARAN (GBPP)
(OUTLINE PROGRAM INSTRUCTION)**

**CHEMICAL ENGINEERING
MATHEMATICS I
(MATEMATIKA TEKNIK KIMIA I)**



**CHEMICAL ENGINEERING DEPARTMENT
FACULTY OF ENGINEERING DIPONEGORO UNIVERSITY**
Jl. Prof. Sudharto, SH, Tembalang, Semarang
Telp/Fax : (024) 7460058
E-mail : tkundip@telkomnet.id

SUBJECT PROGRAM UNIT

Lesson : CHEMICAL ENGINEERING MATEMATIK I
 Lesson Code : TTK 231
 SKS : 2 SKS
 Meeting Time : 2 × 50 minutes
 Meeting : 1st

A. Goals

TIU : At last lecture, collegian able cultivate the raw material and to present them systematically
 TIK : At last lecture, collegian able to present the data on table, chart, equations.

B. Topic

:
 Presentation of technical data

C. Subtopic

1. Presentation data on table
2. Presentation data on chart
3. Presentation data on equation
4. Application on chemical engineering problems

D. Study Activity

Phase	Lecturer activity	Collegian activity	Media and study equipment
Introductory	<ol style="list-style-type: none"> 1. To explain the object scope at first meeting 2. To explain the CEM 1 position on discipline chemical engineering 3. To explain of specimen of CEM 1 utility 	Listening and writing down Listening and writing down Listening and writing down	OHP, black board
Presentation	<ol style="list-style-type: none"> 1. To explain about data, dependent and independent variables 2. To explain the chart type 3. To explain linear scale and logarithm 4. To explain system to present the data on table 5. To explain system to present the data on chart 6. To explain system to present the data on equation 	Listening, pay attention, and asking a question about something that not clear	OHP, black board
Closing	<ol style="list-style-type: none"> 1. To close meeting with 2. Enclose object that have given 3. To give opportunity to collegian to ask a question 4. To give Representation object for future lecture 	Giving question	

	5. Task to Read handbook for second meeting		
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E. Evaluation

Substantive Evaluation by question

F. Reference

- [1] Andersen, L.B., Wensel, L.A., "Introduction to Chemical Engineering", International Student Edition, 1961
- [2] Creese, T.M., Haralick, R.M., "Differential Equation – For Engineers", International Student Edition, Mc. Graw Hill, Inc., 1978.
- [3] Jenson, V.G., "Mathematical Methods in Chemical Engineering", 2nd Ed., Academic Press, London
- [4] Mickley, H.S., Sherwood, T.K., "Applied Mathematics in Chemical Engineering", 2nd Ed., Mc. Graw Hill Book Company, New York.
- [5] Pipes, L.A., Harvill, R.L., "Applied Mathematics for Engineers and Physician ", 3th Ed., International Student Edition, 1971.

SUBJECT PROGRAM UNIT

Lesson : CHEMICAL ENGINEERING MATEMATIC I
 Lesson Code : TKK 231
 SKS : 2 SKS
 Meeting Time : 2 × 50 minutes
 Meeting : 2nd

A. Goals

- TIU : At last lecture, collegian able arrange approach equation from data of variable relation that have given.
- TIK : At last lecture, collegian able to
1. Arrange approach equation by Least Square Method
 2. Arrange approach equation by Lagrange equation
 3. Arrange approach equation by more than one independent variable (multiple regressions)

B. Topic : Approach Equation

C. Subtopic

1. Models of approach equation
2. Semi logarithm and logarithms coordinate
3. Linear regression
4. Multiple regressions
5. Least Square Method
6. Lagrange equation

D. Study Activity

Phase	Lecturer activity	Collegian activity	Media and study equipment
Introductory	Review about object at first meeting To explain the object scope at 2 nd meeting	Listening and writing down Listening and writing down	OHP, black board
Presentation	<ol style="list-style-type: none"> 1. To explain models of approach equation 2. To explain Semi logarithm and logarithms coordinate 3. To explain Linear regression 4. To explain multiple regression 5. To explain Least Square Metho 6. To explain Lagrange equation 	Listening, discussion, interviewer.	OHP
Closing	To close meeting : with <ol style="list-style-type: none"> 1. Enclose object that have given 2. To give opportunity to collegian to ask a question 3. To give representation object for 	Giving question	

	future lecture		
	4. Task to Read handbook for third meeting		

E. Evaluation

Substantive Evaluation by question, giving task about Least Square Method and multiple regressions

F. Reference

- [1] Andersen, L.B., Wensel, L.A., "Introduction to Chemical Engineering", International Student Edition, 1961
- [2] Creese, T.M., Haralick, R.M., "Differential Equation – For Engineers", International Student Edition, Mc. Graw Hill, Inc., 1978.
- [3] Jenson, V.G., "Mathematical Methods in Chemical Engineering", 2nd Ed., Academic Press, London
- [4] Mickley, H.S., Sherwood, T.K., "Applied Mathematics in Chemical Engineering", 2nd Ed., Mc. Graw Hill Book Company, New York.
- [5] Pipes, L.A., Harvill, R.L., "Applied Mathematics for Engineers and Physician ", 3th Ed., International Student Edition, 1971.

SUBJECT PROGRAM UNIT

Lesson : CHEMICAL ENGINEERING MATEMATIC 1
 Lesson Code : TKK 231
 SKS : 2 SKS
 Meeting Time : 2 × 50 minutes
 Meeting : 3rd

A. Goals

TIU : At last lecture, collegians able arranges approach equation (empiric) and calculates the constant from experiment data.

TIK : At last lecture, collegian able to

1. Arrange equation of concentration relation and time of hydrolyses and calculate constant the reaction rate.
2. Calculate the empiric constant on filtration operation if experiment data, filtrate volume, is found out at any time
3. Arrange empiric equation that indicates the relation of heat capacity and temperature.
4. Calculate the empiric constant of liquid viscosity if experiment data, viscosity function of temperature.

B. Topic

Approach equation and application on Chemical Engineering

C. Subtopic

1. Reaction of sucrose hydrolysis
2. Filtration operation
3. Heat capacity of isobutyl alcohol functions of temperature.
4. Viscosity of CCl₄ functions of temperature.

D. Study Activity

Phase	Lecturer activity	Collegian activity	Media and study equipment
Introductory	<ol style="list-style-type: none"> 1. Review about object at 2nd meeting 2. To explain the object scope at 3rd meeting 3. To explain the relation of past object and will explain 	<p>Listening and writing down</p> <p>Listening and writing down</p>	OHP, black board
Presentation	<ol style="list-style-type: none"> 1. To explain arranging application of equation model on Chemical Engineering problems. 2. To explain solution of sucrose hydrolysis problem 3. To explain solution of filtrate operation problem 4. To explain solution of heat capacity of isobutyl alcohol 	<p>Listening, discussion, interviewer.</p> <p>pay attention and discussion</p> <p>pay attention and discussion</p> <p>pay attention and discussion</p>	OHP

	function of temperature problem 5. To explain solution of viscosity of CCl_4 function of temperature problems.	pay attention and discussion	
Closing	To close meeting with 1. Enclose object that have given 2. To give opportunity to collegian to ask a question 3. To give representation object for future meeting 4. Task to Read handbook for 4 th meeting	Giving question	

E. Evaluation

Substantive Evaluation by question, giving task on MTK 1 handbook

F. Reference

- [1] Andersen, L.B., Wensel, L.A., "Introduction to Chemical Engineering", International Student Edition, 1961
- [2] Creese, T.M., Haralick, R.M., "Differential Equation – For Engineers", International Student Edition, Mc. Graw Hill, Inc., 1978.
- [3] Jenson, V.G., "Mathematical Methods in Chemical Engineering", 2nd Ed., Academic Press, London
- [4] Mickley, H.S., Sherwood, T.K., "Applied Mathematics in Chemical Engineering", 2nd Ed., Mc. Graw Hill Book Company, New York.
- [5] Pipes, L.A., Harvill, R.L., "Applied Mathematics for Engineers and Physician ", 3th Ed., International Student Edition, 1971.

SUBJECT PROGRAM UNIT

Lesson : CHEMICAL ENGINEERING MATEMATIC I
 Lesson Code : TKK 231
 SKS : 2 SKS
 Meeting Time : 2 × 50 minutes
 Meeting : 4th

A. Goals

- TIU : At last lecture collegian able to use graphic method to finish up the mathematic problem.
- TIK : At last lecture, collegian able to
1. Finish integration with graphic method
 2. Finish differential with graphic method
 3. Predict the data by interpolation and extrapolation.
 4. Calculate comparison between two components mass by graphic method lever arm rule
 5. Calculate mean value
 6. Finish equation by trial and error method

B. Topic

Graphic Method And Tools To Finish Problems

C. Subtopic

1. Integration by graphic method
2. Differential by graphic method
3. Interpolation and extrapolation.
4. Lever arm rule
5. Mean value
6. Trial and error method

D. Study Activity

Phase	Lecturer activity	Collegian activity	Media and study equipment
Introductory	<ol style="list-style-type: none"> 1. Review about object at 3rd meeting 2. To explain the object scope at 4th meeting 3. To explain the relation of past object and that will explain 	<p>Listening and writing down</p> <p>Listening and writing down</p>	OHP, black board
Presentation	<ol style="list-style-type: none"> 1. to explain integration by graphic method 2. to explain differential with graphic method 3. to explain the meaning and method of interpolation and extrapolation. 4. to explain lever arm rule 5. to explain method to finish mean 	Listening, writing down, discussion, interviewer	OHP

	value and comparison with average value 6. to explain process to finish equation by trial and error method		
Closing	To close meeting with 1. Enclose object that have given 2. To give opportunity to collegian to ask a question 3. To give representation object for future meeting 4. Task to Read handbook for 5 th meeting	Giving question	

E. Evaluation

Substantive Evaluation by question, giving task on MTK I handbook

F. Reference

- [1] Andersen, L.B., Wensel, L.A., "Introduction to Chemical Engineering", International Student Edition, 1961
- [2] Creese, T.M., Haralick, R.M., "Differential Equation – For Engineers", International Student Edition, Mc. Graw Hill, Inc., 1978.
- [3] Jenson, V.G., "Mathematical Methods in Chemical Engineering", 2nd Ed., Academic Press, London
- [4] Mickley, H.S., Sherwood, T.K., "Applied Mathematics in Chemical Engineering", 2nd Ed., Mc. Graw Hill Book Company, New York.
- [5] Pipes, L.A., Harvill, R.L., "Applied Mathematics for Engineers and Physician ", 3th Ed., International Student Edition, 1971.

SUBJECT PROGRAM UNIT

Lesson : CHEMICAL ENGINEERING MATEMATIC I
 Lesson Code : TKK 231
 SKS : 2 SKS
 Meeting Time : 2 × 50 minutes
 Meeting : 5th

A. Goals

TIU : At last lecture, collegian able to use graphic method to finish up the mathematic problem .

TIK : At last lecture, collegian able to

1. Calculate the wide under curve that isn't known the function
2. Arrange equation Cp as temperature function if is known the experiment data ΔH on every temperature range.
3. Calculate comparison of steam and water mass (on certain of temperature, pressure, and enthalpy)
4. Finish mass balance by graphic method
5. Determine mean of reactor temperature at span of time if it is known the temperature data from recorder
6. Calculate mean of monthly production.

B. Topic

Graphic Method and Tools to Finish Problems

C. Subtopic

1. Application of integration by graphic method
2. Application of differential by graphic method
3. Application of lever arm rule
4. Application of mean value

D. Study Activity

Phase	Lecturer activity	Collegian activity	Media and study equipment
Introductory	<ol style="list-style-type: none"> 1. Review about object at 3rd meeting 2. To explain the object scope at 4th meeting 3. To explain the relation of past object and that will explain 	<p>Listening and writing down</p> <p>Listening and writing down</p>	OHP, black board
Presentation	<ol style="list-style-type: none"> 1. to explain finishing example drying time and humidification problems. 2. heat capacity problem 3. comparison of steam and water by Mollier diagram 4. equation mass balance by graphic method from mix acid 	<p>Listening, writing down, discussion, interviewer</p> <p>Pay attention</p> <p>Pay attention</p> <p>Pay attention</p>	OHP, black board

	<ol style="list-style-type: none"> 5. to explain to calculate mean of reactor temperature from recorder data 6. to explain to calculate mean of day production from logarithm sheet. 	Pay attention	
Closing	<p>To close meeting : with</p> <ol style="list-style-type: none"> 1. Enclose object that have given 2. To give opportunity to collegian to ask a question 3. To give representation object for future meeting 4. Task to Read handbook for 6th meeting 	Giving question	

E. Evaluation

Substantive Evaluation by question, giving task on MTK 1 handbook

F. Reference

- [1] Andersen, L.B., Wensel, L.A., "Introduction to Chemical Engineering", International Student Edition, 1961
- [2] Creese, T.M., Haralick, R.M., "Differential Equation – For Engineers", International Student Edition, Mc. Graw Hill, Inc., 1978.
- [3] Jenson, V.G., "Mathematical Methods in Chemical Engineering", 2nd Ed., Academic Press, London
- [4] Mickley, H.S., Sherwood, T.K., "Applied Mathematics in Chemical Engineering", 2nd Ed., Mc. Graw Hill Book Company, New York.
- [5] Pipes, L.A., Harvill, R.L., "Applied Mathematics for Engineers and Physician ", 3th Ed., International Student Edition, 1971.

SUBJECT PROGRAM UNIT

Lesson : CHEMICAL ENGINEERING MATEMATICA I
 Lesson Code : TKK 231
 SKS : 2 SKS
 Meeting Time : 2 × 50 minutes
 Meeting : 6th

A. Goals

TIU : At last lecture, collegian able to transform physic phenomena to equation mathematic

TIK : At last lecture, collegian able to

1. Arrange equation mathematic that indicate concentration of salt on continue dilution process per moment
2. Arrange equation mathematic that indicate concentration of salt on continue mixing process per moment

B. Topic :

Transform Physic Phenomena to Equation Mathematic

C. Subtopic :

1. Dilution problem
2. Mixing problem

D. Study Activity

Phase	Lecturer activity	Collegian activity	Media and study equipment
Introductory	<ol style="list-style-type: none"> 1. Review about object at 5th meeting 2. To explain the object scope at 6th meeting 3. To explain the relation of past object and that will explain 	Listening and writing down Listening and writing down	OHP, black board
Presentation	<ol style="list-style-type: none"> 1. to explain about mass perpetuity law. 2. to explain arranging equation mathematic that indicate concentration of salt on continue dilution process per moment 3. to explain arranging equation mathematic that indicate concentration of salt on continue mixing process per moment 	Listening, writing down, discussion, interviewer Pay attention Pay attention	OHP, black board
Closing	To close meeting : with <ol style="list-style-type: none"> 1. Enclose object that have given 2. To give opportunity to collegian to ask a question 3. To give representation object for 	Giving question	

	future meeting 4. Task to Read handbook for 7 th meeting		
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E. Evaluation

Substantive Evaluation by question, giving task on MTK I handbook

F. Reference

- [1] Andersen, L.B., Wensel, L.A., "Introduction to Chemical Engineering", International Student Edition, 1961
- [2] Creese, T.M., Haralick, R.M., "Differential Equation – For Engineers", International Student Edition, Mc. Graw Hill, Inc., 1978.
- [3] Jenson, V.G., "Mathematical Methods in Chemical Engineering", 2nd Ed., Academic Press, London
- [4] Mickley, H.S., Sherwood, T.K., "Applied Mathematics in Chemical Engineering", 2nd Ed., Mc. Graw Hill Book Company, New York.
- [5] Pipes, L.A., Harvill, R.L., "Applied Mathematics for Engineers and Physician ", 3th Ed., International Student Edition, 1971.

SUBJECT PROGRAM UNIT

Lesson : CHEMICAL ENGINEERING MATEMATICA I
 Lesson Code : TKK 231
 SKS : 2 SKS
 Meeting Time : 2 × 50 minutes
 Meeting : 7th

A. Goals

- TIU : At last lecture, collegian able to transform physic phenomena to equation mathematic.
- TIK : At last lecture, collegian able to
1. Arrange equation mathematic that indicate concentration of solute in liquid phase on batch distillation per moment.
 2. Arrange equation mathematic that indicate temperature distribution on slab and massive ball

B. Topic

:
 Graphic Method and Tools to Finish Problems

C. Subtopic

1. Distillation problem
2. Heat transfer problem

D. Study Activity

Phase	Lecturer activity	Collegian activity	Media and study equipment
Introductory	<ol style="list-style-type: none"> 1. Review about object at 6th meeting 2. To explain the object scope at 7th meeting 3. To explain the relation of past object and that will explain 	Listening and writing down Listening and writing down	OHP, black board
Presentation	<ol style="list-style-type: none"> 1. to explain about mass perpetuity law. 2. to explain arranging equation mathematic that indicate concentration of salt on continue dilution process per moment 3. to explain arranging equation mathematic that indicate concentration of salt on continue mixing process per moment 	Listening, writing down, discussion, interviewer Pay attention	OHP, black board
Closing	To close meeting with <ol style="list-style-type: none"> 1. Enclose object that have given 	Giving question	

	2. To give opportunity to collegian to ask a question 3. To give representation object for future meeting 4. Task to Read handbook for 8 th meeting		
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E. Evaluation

Substantive Evaluation by question, giving task on MTK 1 handbook

F. Reference

- [1] Andersen, L.B., Wensel, L.A., "Introduction to Chemical Engineering", International Student Edition, 1961
- [2] Creese, T.M., Haralick, R.M., "Differential Equation – For Engineers", International Student Edition, Mc. Graw Hill, Inc., 1978.
- [3] Jenson, V.G., "Mathematical Methods in Chemical Engineering", 2nd Ed., Academic Press, London
- [4] Mickley, H.S., Sherwood, T.K., "Applied Mathematics in Chemical Engineering", 2nd Ed., Mc. Graw Hill Book Company, New York.
- [5] Pipes, L.A., Harvill, R.L., "Applied Mathematics for Engineers and Physician ", 3th Ed., International Student Edition, 1971.

SUBJECT PROGRAM UNIT

Lesson : CHEMICAL ENGINEERING MATEMATIC I
 Lesson Code : TKK 231
 SKS : 2 SKS
 Meeting Time : 2 × 50 minutes
 Meeting : 8th

A. Goals

TIU : At last lecture, collegian able to transform physic phenomena to equation mathematic on space coordinate.

TIK : At last lecture, collegian able to

1. Explain space coordinate: quadrangle, ball, and cylinder
2. Arrange mathematic equation that indicate mass flow rate on triple dimension.
3. Arrange mathematic equation that indicate heat flow rate by conduction on massive ball

B. Topic

Graphic Method and Tools to Finish Problems

C. Subtopic

1. Space coordinate types
2. Mass transfer triple dimension
3. Heat transfer triple dimension

D. Study Activity

Phase	Lecturer activity	Collegian activity	Media and study equipment
Introductory	<ol style="list-style-type: none"> 1. Review about object at 7th meeting 2. To explain the object scope at 8th meeting 3. To explain the relation of past object and that will explain 	<p>Listening and writing down</p> <p>Listening and writing down</p>	OHP, black board
Presentation	<ol style="list-style-type: none"> 1. to explain space coordinate: quadrangle, ball, and cylinder 2. to explain how to arrange mathematic equation that indicate mass flow rate on triple dimension. 3. to explain how to arrange mathematic equation that indicate heat flow rate by conduction on massive ball 	<p>Listening, writing down</p> <p>Pay attention</p> <p>Pay attention</p>	OHP, black board
Closing	<p>To close meeting : with</p> <ol style="list-style-type: none"> 1. Enclose object that have given 2. To give opportunity to collegian to ask a question 	Giving question	

E. Evaluation

Substantive Evaluation by question, giving task on MTK 1 handbook

F. Reference

- [1] Andersen, L.B., Wensel, L.A., "Introduction to Chemical Engineering", International Student Edition, 1961
- [2] Creese, T.M., Haralick, R.M., "Differential Equation – For Engineers", International Student Edition, Mc. Graw Hill, Inc., 1978.
- [3] Jenson, V.G., "Mathematical Methods in Chemical Engineering", 2nd Ed., Academic Press, London
- [4] Mickley, H.S., Sherwood, T.K., "Applied Mathematics in Chemical Engineering", 2nd Ed., Mc. Graw Hill Book Company, New York.
- [5] Pipes, L.A., Harvill, R.L., "Applied Mathematics for Engineers and Physician ", 3th Ed., International Student Edition, 1971.

OUTLINE PROGRAM INSTRUCTION

TITLE LESSON : CHEMICAL ENGINEERING MATEMATIC 1 (team teaching 8 meeting + 1 module test)
 LESSON CODE : TKK 231/2 SKS
 DESCRIPTION : Chemical Engineering Mathematic (MTK 1) is a lesson skill of c that learns mathematic method to finish technical problem.
 TIU : after take this lesson, collegian able to secularize mathematic method to solve simple Chemical Engineering problem.

No	TIK	Topic	Subtopic	Time (minute)	reference
1		Presentation of technique data	1. Presentation data on table 2. Presentation data on chart 3. Presentation data on equation 4. Application on chemical engineering problems	100	[1], [3], [4],[5]
2		Approach equation	1. Models of approach equation 2. Semi logarithm and logarithms coordinate 3. Linear regression 4. Multiple regressions 5. Least Square Method 6. Lagrange equation	2×100	[1], [3], [4]
3		Solving problem method	1. integration by graphic method 2. differential by graphic method 3. interpolation and extrapolation. 4. lever arm rule 5. mean value 6. trial and error method	2×100	[1], [2], [3],[4]
4		Mathematic formula for chemical engineering problem	1. Mass and energy perpetuity law. 2. Equation Model or problem :mixing, dilution, batch distillation, heat transfer	2×100	[1], [2], [3], [4],[5]
5		Space coordinate	1. space coordinate types 2. mass transfer triple dimension 3. heat transfer triple dimension	100	[1], [2], [3], [4],[5]

Reference

- [1] Andersen, L.B., Wensel, L.A., "Introduction to Chemical Engineering", International Student Edition, 1961
- [2] Creese, T.M., Haralick, R.M., "Differential Equation – For Engineers", International Student Edition, Mc. Graw Hill, Inc., 1978.
- [3] Jenson, V.G., "Mathematical Methods in Chemical Engineering", 2nd Ed., Academic Press, London
- [4] Mickley, H.S., Sherwood, T.K., "Applied Mathematics in Chemical Engineering", 2nd Ed., Mc. Graw Hill Book Company, New York.
- [5] Pipes, L.A., Harvill, R.L., "Applied Mathematics for Engineers and Physician ", 3th Ed., International Student Edition, 1971.

**SATUAN ACARA PERKULIAHAN (S A P)
(SUBJECT PROGRAM UNIT)**

**GARIS-GARIS BESAR PROGRAM
PENGAJARAN (GBPP)
(OUTLINE PROGRAM INSTRUCTION)**

**INDUSTRIAL MICROBIOLOGY
(MIKROBIOLOGI INDUSTRI)**



**CHEMICAL ENGINEERING DEPARTMENT
FACULTY OF ENGINEERING DIPONEGORO UNIVERSITY**
Jl. Prof. Sudharto, SH, Tembalang, Semarang
Telp/Fax : (024) 7460058
E-mail : tkundip@telkomnet.id

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY
Subject Code : TKK. 235 / 2 SKS
Duration : 2 x 50 minutes
First meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Industrial Microbiology subject

- Students are expected to describe the basic concept of fermentation process.
- Students are expected to describe the general objectives of fermentation process.
- Students are expected to explain the process that must be followed in the fermentation industry.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, chapter Introduction of Fermentation Process, students 3rd semester are able to:

- Describing the basic concept of fermentation process that is run in industries.
- Describing the general objectives of fermentation process.
- Explaining the process that must be followed in the fermentation process.
- Explaining the development of fermentation industry chronologically.

B. MAIN CHAPTER : Introduction of Fermentation Process

C. SUB MAIN CHAPTER :

- The definition and the objective of fermentation process.
- The development of fermentation in industry
- The general step of fermentation process

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the lecturing matter in the first meeting 2. Describing the definition and the objective of fermentation process 3. Describing the GIO and SIO. in the first meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
The serving	<ol style="list-style-type: none"> 1. Describing the basic operation of fermentation 2. Describing the development of fermentation in industry 3. Describing the general step of fermentation process 	> Taking care and various discussion	OHP. LCD. white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. Giving some questions 	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

Gibbon, G. C. "Biotechnology for Development Principle and Practice Relevant to Developing Countries". ASEAN Sub Committee on Biotechnology, 1994.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY
Subject Code : TKK. 235 / 2 SKS
Duration : 2 x 50 minutes
Second Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Industrial Microbiology subject

- Students are expected to understand why the saccharificacy process of raw materials so it can be fermented is needed.
- Students are expected to explain the sources of amylase
- Students are expected to explain the methods of getting amylase largely that can be used in industry

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, chapter: alcohol fermentation, students 3rd semester are able to:

- Define the saccharificacy process enzymatically or chemically.
- Describing the relation between the saccharificacy process and the fermentation process
- Describing the starter purpose with "Build Up Procedure" method.
- Describing the run of the process by flow diagram in alcohol fermentation process.

B. MAIN CHAPTER : Alcohol Fermentation

C. SUB MAIN CHAPTER :

- The kinds of saccharificacy process
- The sources of amylase
- The production of alcohol from the sugar cane
- The production of alcohol from sulfite-liquor

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the second meeting 2. Describing the advantages of alcohol in industry 3. Describing the GIO and SIO. in the second meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Describing the kinds of saccharificacy process 2. Describing the sources of amylase 3. Describing the general step of fermentation process	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

Gibbon, G. C., "Biotechnology for Development Principle and Practice Relevant to Developing Countries", ASEAN Sub Committee on Biotechnology. 1994.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY
Subject Code : TKK. 235 / 2 SKS
Duration : 4 x 50 minutes
3rd and 4th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Industrial Microbiology subject

- Students are able to explain the differences between the multiplication process and the fermentation process
- Students are able to describe what kind of steps that must be followed in the yeast multiplication process not only for baker's yeast but also for lipid synthesis or for food and fodder yeast
- Students are able to explain the run of the process by diagram in the baker's yeast, lipid, food and fodder yeast synthesis.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, chapter: yeast multiplication process. students 3rd semester are able to:

- Describing the differences between the multiplication process and the fermentation process mainly at the operation condition and the reaction
- Explaining the function of nutrient and also what kind of factors that can influence the baker's yeast, lipid, food and fodder yeast synthesis.

B. MAIN CHAPTER : Yeast Multiplication Process

C. SUB MAIN CHAPTER :

- The baker's yeast synthesis.
- The lipid synthesis
- Food and fodder yeast synthesis

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the third meeting 2. explaining the differences between the multiplication process and the fermentation process 3. Describing the GIO and SIO. in the third meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Describing the steps of the baker's yeast synthesis 2. Describing the steps of the lipid synthesis 3. Describing the steps of food and fodder yeast synthesis	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

Gibbon, G. C., "Biotechnology for Development Principle and Practice Relevant to Developing Countries", ASEAN Sub Committee on Biotechnology. 1994.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY
Subject Code : TKK. 235 / 2 SKS
Duration : 2 x 50 minutes
5th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Industrial Microbiology subject

- Students are expected able to describe the bacteria's role at the fermentation industry mainly in acetone butanol industry and vinegar industry.
- Students are expected able to describe what kind of steps that must be followed in acetone butanol industry and vinegar industry.
- Students are able to explain the run of the process by block diagram

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main subject, chapter : bacteria's role at the fermentation industry. students 3rd semester are able to:

- Mentioning some industries that use the bacteria's activity in the process
- Explaining what kind of factors that can influence acetone butanol fermentation and vinegar fermentation.
- Explaining the isolation method for obtaining the bacterial that have a high quality of fermentation potency.
- Describing not only the block diagram but also the flow process diagram at acetone butanol fermentation and vinegar fermentation
- Explaining completely with the illustration of the vinegar fermentation by slow or quick process.
- Explaining the probability of failed process chemically or biologically at the vinegar fermentation.

B. MAIN CHAPTER : The Bacteria's Role at The Fermentation Industry

C. SUB MAIN CHAPTER :

- The fermentation of acetone butanol
- The fermentation of vinegar

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the fifth meeting 2. Describing the bacteria's role at the fermentation industry 3. Describing the GIO and SIO. in the fifth meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The services	1. Describing what kind of factors that can influence the fermentation process 2. Explaining the complete process of acetone butanol fermentation 3. Explaining the complete process of vinegar fermentation	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

Gibbon, G. C.. "Biotechnology for Development Principle and Practice Relevant to Developing Countries". ASEAN Sub Committee on Biotechnology. 1994.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY
Subject Code : TKK. 235 / 2 SKS
Duration : 2 x 50 minutes
Sixth Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Industrial Microbiology subject

- Students are expected able to describe what kind of steps that must be followed in beer industry.
- Students are expected able to describe what kind of steps that must be followed in wine industry

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the main chapter: Beer and wine industry, students in the 3rd semester are expected able to:

- Explaining the ingredients of beer so it can be classified in "complex beverage"
- Explaining the steps of in the beer production and also the additional ingredients in that process
- Describing the process condition of fermentation and the kind of beer that is produced.
- Explaining the factors that cause the frazzle of beer that is caused of operation condition or storing operation
- Describing the kind of beers that are produced from brewing industry

B. MAIN CHAPTER : Beer and Wine Fermentation

C. SUB MAIN CHAPTER :

- Beer system and mashing process
- Beer production
- The kind of beer and the factors that cause the frazzle of beer
- The wine production
- The beverage of fermentation product that is distilled

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the sixth meeting 2. Describing about "complex beverage" 3. Describing the GIO and SIO, in the sixth meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Describing the definition of Mashing process 2. Explaining the theory of beer production 3. Explaining the kind of beer and the factors that cause the frazzle of beer 4. explaining the wine production 5. Explaining the minimum product of fermentation that is distilled	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFERENCES

Gibbon, G. C., "Biotechnology for Development Principle and Practice Relevant to Developing Countries", ASEAN Sub Committee on Biotechnology, 1994.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY
Subject Code : TKK. 235 / 2 SKS
Duration : 2 x 50 minutes
7th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Industrial Microbiology subject

- Students are expected able to describe the function of each actived microbe at the soy sauce production.
- Students are expected able to describe the run of the soy sauce production by block diagram or outline scheme.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, the main chapter: soy sauce production, students in the 3rd semester is expected able to:

- Explaining the function of each actived microbe at the soy sauce production and the biochemical changes that are occurred at the soy sauce production by fermentation
- Explaining the koji production and fermentation process in mineral salt liquid.
- Describing the function of additional ingredients that are used in soy sauce production
- Describing the run of the soy sauce production process by outline scheme.

B. MAIN CHAPTER : Soy sauce Fermentation

C. SUB MAIN CHAPTER :

- The kecap production
- The soy sauce production

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the 7 th meeting 2. Describing the meal product of fermentation 3. Describing the GIO and SIO, in the 7 th meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Describing The kecap production 2. Explaining The soy sauce production	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFFERENCES

1. Gibbon, G. C.. "Biotechnology for Development Principle and Practice Relevant to Developing Countries", ASEAN Sub Committee on Biotechnology, 1994.
2. Prescott, S. C. "Industrial Microbiology", 1959.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY
Subject Code : TKK. 235 / 2 SKS
Duration : 2 x 50 minutes
Eighth Meeting (Evaluation)

I. Evaluation Matter : 1st till 7th matter subject

II. The Evaluation of Learning and Teaching Process : answering the list about learning and teaching process

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY
Subject Code : TKK. 235 / 2 SKS
Duration : 4 x 50 minutes
9th and 10th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Industrial Microbiology subject

- Students are expected able to describe the complete steps and the operation condition of lactic acid production.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, the main chapter: Lactic Acid Fermentation, students in the 3rd semester are expected able to:

- Explaining the function lactic acid in industry
- Explaining the fermentation of lactic acid
- Explaining the choosing of microorganism and the media design for microorganism growth.
- Describing the best condition of the lactic acid process.
- Describing by flow diagram by mean the condition of the lactic acid production from sugar cane

B. MAIN CHAPTER : Lactic acid fermentation

C. SUB MAIN CHAPTER :

- The application of lactic acid in industry
- Lactic acid fermentation
- The choosing of microorganism
- Media design for growth
- The best condition of the lactic acid process
- The steps of lactic acid production

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	1. Describing the materials in the 9 th and 10 th meeting 2. Describing about the lactic acid and the application of lactic acid in industry 3. Describing the GIO and SIO, in the 9 th and 10 th meeting	> Taking care and hearing. > Asking the questions.	OHP, LCD, white board
The serving	1. Describing the biochemist of Lactic acid fermentation 2. explaining the choosing of microorganism 3. Explaining the media design for growth 4. Explaining the best condition of the lactic acid fermentation 5. describing the steps of lactic acid production from the sugar cane	> Taking care and various discussion	OHP, LCD, white board
Ending	1. Making a summary of the chapter which has been described 2. Giving some questions	> Taking care and discussion > Doing the examination	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY
Subject Code : TKK. 235 / 2 SKS
Duration : 4 x 50 minutes
11th and 12th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Industrial Microbiology subject

- Students are expected able to describe the complete steps and the operation condition of citric acid production.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, the main chapter: Citric Acid Fermentation, students in the 3rd semester are expected able to:

- Explaining the function citric acid in industry
- Explaining the biochemist fermentation of citric acid
- Explaining the choosing of microorganism and the media design for microorganism growth.
- Explaining the kind of citric acid fermentation
- Describing the best condition of the citric acid process.
- Describing by flow diagram by mean the condition of the citric acid production from sugar cane

B. MAIN CHAPTER : Citric acid fermentation

C. SUB MAIN CHAPTER :

- The application of citric acid in industry
- The biochemist fermentation of Citric acid
- The choosing of microorganism
- The kind of fermentation process of Citric acid
- The best condition of the citric acid process
- The steps of citric acid production from sugar cane

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the materials in the 11th and 12th Meeting 2. Describing the application of citric acid in industry 3. Describing the GIO and SIO, in the 11th and 12th Meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the question 	OHP, LCD, white board
The serving	<ol style="list-style-type: none"> 1. Describing the biochemist fermentation of Citric acid 2. Explaining the choosing of microorganism and the kind of fermentation process of Citric acid 3. Explaining the kind of fermentation process of Citric acid. 4. Describing the best condition of the citric acid process 5. Explaining the steps of citric acid production from sugar cane 	<ul style="list-style-type: none"> > Taking care and various discussion 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. discuss the assignment 	<ul style="list-style-type: none"> > Taking care and discussion > discuss 	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY
Subject Code : TKK. 235 / 2 SKS
Duration : 4 x 50 minutes
13th and 14th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Industrial Microbiology subject

- Students are expected able to describe the complete steps and the operation condition of amylase enzyme.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, the main chapter: the Production of Amylase Enzyme, students in the 3rd semester are expected able to:

- Explaining the kind of enzymes in industry
- Explaining the sources of enzyme
- Explaining the steps of process of enzyme production
- Explaining the complete steps and the operation condition of amylase enzyme production
- Describing the steps of cell destruction.
- Describing the methods of protein sedimentation

B. MAIN CHAPTER : the amylase enzyme Production

C. SUB MAIN CHAPTER :

- The application of enzyme in industry
- The sources of enzyme
- The steps of enzyme production process
- The production of amylase enzyme
- The steps of destroying a cell
- The methods of protein sedimentation

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the materials in the 13th and 14th Meeting 2. explaining about enzyme and the application 3. Describing the GIO and SIO, in the 13th and 14th Meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking a question 	OHP, LCD, white board
The serving	<ol style="list-style-type: none"> 1. Describing the kind of enzymes and the sources 2. Explaining the steps of enzyme production process 3. Describing the methods of producing amylase enzyme 4. Describing the steps of destroying a cell 5. Describing the methods of protein sedimentation 	<ul style="list-style-type: none"> > Taking care and various discussion 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. discuss the assignment 	<ul style="list-style-type: none"> > Taking care and discussion 	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFFERENCES

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY
Subject Code : TKK. 235 / 2 SKS
Duration : 2 x 50 minutes
15th Meeting

A. OBJECTIVES

1. GENERAL INSTRUCTIONAL OBJECTIVES (GIO)

After following Industrial Microbiology subject

- Students are expected able to describe the complete steps and the operation condition of penicillium production.

2. SPECIFIC INSTRUCTIONAL OBJECTIVES (SIO)

After following the subject, the main chapter: Antibiotic, students in the 3rd semester are expected able to:

- Explaining the kind of Antibiotics and the advantages
- Explaining the complete steps and the operation condition of penicillium production
- Explaining the methods of obtaining a high productivity at the penicillium production

B. MAIN CHAPTER : Antibiotics

C. SUB MAIN CHAPTER :

- The Antibiotics influence
- The various and the uses of Antibiotics
- The steps of penicillium production process
- The methods of obtaining a high productivity at the Antibiotics production

D. LEARNING AND TEACHING ACTIVITIES

The Steps	Teaching Activities	Students Activities	Media
Introduction	<ol style="list-style-type: none"> 1. Describing the materials in the 15th meeting 2. Describing about history of Antibiotics 3. Describing the GIO and SIO, in the 15th meeting 	<ul style="list-style-type: none"> > Taking care and hearing. > Asking the questions. 	OHP, LCD, white board
The serving	<ol style="list-style-type: none"> 1. Describing the various and the uses of Antibiotics 2. Explaining the steps of penicillium production process 3. Explaining the methods of obtaining a high productivity at the Antibiotics production 	<ul style="list-style-type: none"> > Taking care and various discussion 	OHP, LCD, white board
Ending	<ol style="list-style-type: none"> 1. Making a summary of the chapter which has been described 2. discuss the assignment 	<ul style="list-style-type: none"> > Taking care and discussion 	OHP, LCD, white board

E. EVALUATION

1. Giving some questions and group assignments to be discussed so it can be understood
2. Students can understand the subject that has been described.

F. REFFERENCES

- Blanch, H. W. and Clarck. D. S.. "Biochemical Engineering" New York : Mercel Dekker, Inc.. 1997.
 Sragg, A. H.. "Biotechnology for Engineers : Biological System in Technological". John Wiley & Sons. New York, 1988.

SUBJECT PROGRAM UNIT

Subject : INDUSTRIAL MICROBIOLOGY

Subject Code : TKK. 235 / 2 SKS

Duration : 2 x 50 minutes

16th Meeting (Evaluation)

I. Evaluation Matter : 9th till 15th matter subject

II. The Evaluation of Learning and Teaching Process : answering the list about learning and teaching process

COURSE OUTLINE

Course Outline is a formula of instructional duty and the principals of industrial microbiology subject. In the course outline, industrial microbiology consist of some components. They are:

1. General Instructional Objectives at subject level
2. Specific Instructional Objectives at the main chapter level
3. Main chapter (division of subject)
4. Sub main chapter (division of main chapter)
5. Time estimation that is used for every main chapter
6. Reference

OUTLINE PROGRAM INSTRUCTION

Subject	: INDUSTRIAL MICROBIOLOGY (Lecturer Team : 16 times meeting)
Subject Code	: TIK. 218 / 2 SKS
Description	: Industrial microbiology Subject gives provision knowledge about : Alcohol production, organic acids, single cell protein, antibiotics, enzyme, beer, wine, soy sauce, and kecap
GIO	: After following industrial microbiology subject, the students are expected able to do and have a skill of Alcohol, organic acids, single cell protein, antibiotics, enzyme, beer, wine, soy sauce, and kecap production.

No.	SIO	Main Chapter	Sub Main Chapter	Time Estimation	Reference
1.	The students can describe the basic concept and the steps of process that is done in fermentation process	The introduction of fermentation process	<ul style="list-style-type: none"> ▪ The definition and the objective of fermentation process. ▪ The development of fermentation in industry ▪ The general step of fermentation process 	100 minutes	Gibbon, G. C., "Biotechnology for Development Principle and Practice Relevant to Developing Countries". ASEAN Sub Committee on Biotechnology, 1994. Shuler, M. L., "Bioprocess Engineering Basic Concept", Prentice Hall, International, Inc, New Jersey. 1992
2.	The students have to Describe the run of the process by flow or block diagram in alcohol fermentation process	Alcohol fermentation	<ul style="list-style-type: none"> ▪ The kinds of saccharificacy process ▪ The sources of amylase ▪ The production of alcohol from the sugar cane ▪ The production of alcohol from sulfite-liquor 	100 minutes	Prescott, S. C. "Industrial Microbiology", 1959. Stanbury, P. F., "Principles of Fermentation Technology". 1984.
3.	The students are expected to have the skill of the baker's yeast, lipid, food and fodder yeast synthesis.	The yeast multiplication process	<ul style="list-style-type: none"> ▪ The baker's yeast synthesis. ▪ The lipid synthesis ▪ Food and fodder yeast synthesis 	100 minutes	Prescott, S. C. "Industrial Microbiology", 1959. Gibbon, G. C., "Biotechnology for Development Principles and Practice Relevant to Developing Countries". ASEAN Sub Committee on Biotechnology, 1994.
4.	The students have to Describe the run of the process by flow or block diagram and the factors that influence in the alcohol fermentation process	bacteria's role at the fermentation industry	<ul style="list-style-type: none"> ▪ The fermentation of acetone butanol ▪ The fermentation of vinegar 	100 minutes	Gibbon, G. C., "Biotechnology for Development Principles and Practice Relevant to Developing Countries". ASEAN Sub Committee on Biotechnology, 1994. Prescott, S. C. "Industrial Microbiology", 1959.
5.	The students have to Describe the run of the	the beer and wine fermentation	<ul style="list-style-type: none"> ▪ Beer system and mashing process ▪ Beer production ▪ the factors that cause 	100 minutes	Gibbon, G. C., "Biotechnology for Development Principles and

	process by flow or block diagram and the factors that influence in the beer and wine fermentation process		the frazzle of beer <ul style="list-style-type: none"> ▪ The kind of beer and the factors that cause the frazzle of beer ▪ The wine production ▪ The beverage of fermentation product that is distilled 		Practice Relevant to Developing Countries", ASEAN Sub Committee on Biotechnology, 1994. Prescott, S. C. "Industrial Microbiology", 1959.
6.	The students have to Describe the run of the process by flow or block diagram and the factors that influence in the soy sauce or kecap fermentation process	Soy sauce or kecap fermentation	<ul style="list-style-type: none"> ▪ The kecap production ▪ The biochemist changes in the production of soy sauce by fermentation 	100 minutes	Gibbon, G. C., "Biotechnology for Development Principles and Practice Relevant to Developing Countries", ASEAN Sub Committee on Biotechnology, 1994. Prescott, S. C. "Industrial Microbiology", 1959.
7.	The students have to Describe the run of the process by flow or block diagram and the factors that influence in the lactic acid fermentation process	lactic acid fermentation	<ul style="list-style-type: none"> ▪ The application of lactic acid in industry ▪ Lactic acid fermentation ▪ The choosing of microorganism ▪ Media design for growth ▪ The best condition of the lactic acid process ▪ The steps of lactic acid production 	100 minutes	Atkinson, B., and Mavituna F., "Biochemical Engineering and Biotechnology Hand Book." 2 nd edition. Stockton Press. New York, 1991. Blanch, H. W. and Clark, D. S., "Biochemical Engineering" New York : Mercel Dekker, Inc., 1997. Buchta, K. "Lactic Acid" In Biotechnology, Ed. Rehm H. J., VCH Verlag Weinheim, Germany, 3, 1983.
8.	The students have to Describe the various kind of methods, run of the process by flow or block diagram and the factors that influence in the citric acid fermentation process	citric acid fermentation	<ul style="list-style-type: none"> ▪ Explaining the application of citric acid in industry ▪ Explaining the biochemist fermentation of citric acid ▪ Explaining the choosing of microorganism and the media design for microorganism growth. ▪ Explaining the kind of citric acid fermentation ▪ Describing the best 	100 minutes	Blanch, H. W. and Clark, D. S., "Biochemical Engineering" New York : Mercel Dekker, Inc., 1997. Sraggg, A. H., "Biotechnology for Engineers : Biological System in Technological", John Wiley & Sons. New York, 1988.

			condition of the citric acid process. Describing the steps of citric acid production		
9.	Students are expected able to describe the complete steps and the operation condition of citric acid production.	Amylase Enzyme	<ul style="list-style-type: none"> Explaining the application of enzymes in industry Explaining the sources of enzyme Explaining the steps of process of enzyme production Explaining the complete steps and the operation condition of amylase enzyme production Describing the steps of cell destruction. Describing the methods of protein sedimentation 	100 minutes	<p>Blanch, H. W. and Clarck, D. S., "Biochemical Engineering" New York : Mercel Dekker, Inc., 1997.</p> <p>Sraggg, A. H., "Biotechnology for Engineers : Biological System in Technological", John Wiley & Sons, New York, 1988.</p> <p>Zubay, G. L., "Biochemistry", USA: Addison-Wesley Publishing Company, 1984.</p>
10.	The students can explain the diagram and the methods of obtaining a high productivity at the penicillium production	antibiotics	<ul style="list-style-type: none"> The Antibiotics influence The various and the uses of Antibiotics The steps of penicillium production process The methods of obtaining a high productivity at the Antibiotics production 	100 minutes	<p>Blanch, H. W. and Clarck, D. S., "Biochemical Engineering" New York : Mercel Dekker, Inc., 1997.</p> <p>Sraggg, A. H., "Biotechnology for Engineers : Biological System in Technological", John Wiley & Sons, New York, 1988.</p>

LECTURING CONTRACT
(PEDOMAN PERKULIAHAN MAHASISWA)

Subject Title : Industrial Microbiology
Subject code : TKK. 218 / 2 SKS
Lecturer : > Ir. H. Abdullah, M. S. Ph.D
> Ir. Sudarmadji
The day/date of meeting : Friday / 2nd week / 4th Semester
The place of meeting : C.1.2 / C.2.1 Chemical Engineering

A. THE SUBJECT ADVANTAGES

Industrial Microbiology is very important in understanding the uses of microorganism in biochemical process of chemical industries. Lately, it is very well-known as biotechnology. It is employed the biochemist, microbiologist, and engineering science thoroughly in chemical industries. The chemical industries which use biological process gives a bit of side effect to the environment and cheaper cost, so the industries that use this bio process can develop rapidly. There are some biotechnology products. They are organic acids, alcohol, antibiotics, and enzyme that are very important in industries or human living. Because of the importance, the students have to be supplied a skill about producing alcohol, citric acid, lactic acid, amylase enzyme, and antibiotic.

B. PROBLEM DESCRIPTION

Industrial microbiology Subject gives provision knowledge about : the basic operation of fermentation, applied microorganism in industries, the application process in alcohol industry, organic acid, antibiotic, and enzyme industry.

C. INSTRUCTIONAL OBJECTIVES

At the end of Industrial Microbiology Subject, the students are expected to have ability and skill majoring :

1. Securing the operation basic of fermentation process.
2. Securing the uses of microorganism in fermentation process.
3. Securing the steps of enzyme technology

D. LECTURING STRATEGY

The lecturing method by speech or discussion. So the students can do some exercise for example organization, communication, and team working. For that reason, the lecturer gives some team duties that discussing a certain problem. There are 4-5 persons each team. They will presentate their assignment in front of the class and the lecturer becomes the moderator.

E. LECTURING MATERY

The text book that will be used in lecturing activity:

1. Gibbon, G. C., "Biotechnology for Development Principle and Practice Relevant to Developing Countries". ASEAN Sub Committee on Biotechnology, 1994.
2. Shuler, M. L., "Bioprocess Engineering Basic Concept", Prentice Hall, International, Inc, New Jersey, 1992
3. Prescott, S. C., "Industrial Microbiology", 1959.
4. Stanbury, P. F., "Principles of Fermentation Technology", 1984.
5. Atkinson, B., and Mavituna F., "Biochemical Engineering and Biotechnology Hand Book." 2nd edition, Stockton Press, New York, 1991.
6. Blanch, H. W. and Clarck, D. S., "Biochemical Engineering" New York : Mercel Dekker, Inc., 1997.
7. Buchta, K., "Lactic Acid" In Biotechnology, Ed. Rehm H. J., VCH Verlag Weinheim, Germany, 3, 1983.
8. Sraggg, A. H., "Biotechnology for Engineers : Biological System in Technological", John Wiley & Sons, New York. 1988.
9. Zubay, G. L., "Biochemistry". USA: Addison-Wesley Publishing Company. 1984.

F. ASSIGNMENT

1. The lecturing activity is started according to meeting schedule, so the students are expected to read the text book first in the library.
2. Finishing the team assignment, 4-7 persons each team.

3. Mid semester or module will be held in the 7th or 8th meeting, and the last examination will be served in essay and arithmetic question.

G. EVALUATION CRITERIA

Here is the evaluation criteria in Industrial Management subject :

Mark	:	A	AB	B	BC	C	CD	D	E
Weight	:	4,0	3,5	3,0	2,5	2,0	1,5	1,0	0,0

The component that will be evaluated in the end of lecturing are :

1. Team assignment, given : 30%
2. Modul, given : 70%
3. From that evaluation, point 1 and 2, if the minimum mark > 75 (B), the students will be free from the last evaluation.

H. LECTURING SCHEDULE

No.	week	Main Chapter	Sub Main Chapter	Reference
1.	1 st	The introduction of fermentation process	<ul style="list-style-type: none"> ▪ The definition and the objective of fermentation process. ▪ The development of fermentation in industry ▪ The general step of fermentation process 	1, 2, 4
2.	2 nd	Alcohol fermentation	<ul style="list-style-type: none"> ▪ The kinds of saccharificacy process ▪ The sources of amylase ▪ The production of alcohol from the sugar cane ▪ The production of alcohol from sulfite-liquor 	1, 2, 3
3.	3 rd , 4 th	The yeast multiplication process	<ul style="list-style-type: none"> ▪ The baker's yeast synthesis. ▪ The lipid synthesis ▪ Food and fodder yeast synthesis 	1, 2, 3
4.	5 th	bacteria's role at the fermentation industry	<ul style="list-style-type: none"> ▪ The fermentation of acetone butanol ▪ The fermentation of vinegar 	1, 2, 3
5.	6 th	the beer and wine fermentation	<ul style="list-style-type: none"> ▪ Beer system and mashing process ▪ Beer production ▪ the factors that cause the frazzle of beer ▪ The kind of beer and the factors that cause the frazzle of beer ▪ The wine production ▪ The beverage of fermentation product that is distillated 	1, 2, 3
6.	7 th	Soy sauce or kecap fermentation	<ul style="list-style-type: none"> ▪ The kecap production ▪ The biochemist changes in the production of soy sauce by fermentation 	1, 2, 3
7.	8 th	evaluation		
8.	9 th , 10 th	lactic acid fermentation	<ul style="list-style-type: none"> ▪ The application of lactic acid in industry ▪ Lactic acid fermentation ▪ The choosing of microorganism ▪ Media design for growth ▪ The best condition of the lactic acid process ▪ The steps of lactic acid production 	5, 7, 9

9.	11 th , 12 th	citric acid fermentation	<ul style="list-style-type: none"> ▪ Explaining the application of citric acid in industry ▪ Explaining the biochemist fermentation of citric acid ▪ Explaining the choosing of microorganism and the media design for microorganism growth. ▪ Explaining the kind of citric acid fermentation ▪ Describing the best condition of the citric acid process. ▪ Describing the steps of citric acid production 	6, 8
10.	13 th -14 th	Amylase Enzyme	<ul style="list-style-type: none"> ▪ Explaining the application of enzymes in industry ▪ Explaining the sources of enzyme ▪ Explaining the steps of process of enzyme production ▪ Explaining the complete steps and the operation condition of amylase enzyme production ▪ Describing the steps of cell destruction. ▪ Describing the methods of protein sedimentation 	6, 8
11.	15 th	antibiotics	<ul style="list-style-type: none"> ▪ The Antibiotics influence ▪ The various and the uses of Antibiotics ▪ The steps of penicillium production process ▪ The methods of obtaining a high productivity at the Antibiotics production 	6, 8
12.	16 th	Second evaluation		

The lecturing activity is based on lecturing Activity Units schedule.