



TEACHING-LEARNING CONTRACT
LEARNING PROGRAM OUTLINE
LEARNING UNIT PROGRAM

QUEUEING THEORY
PAS 127

UPT-PUSTAK-UNRIP
No. Daft: 0070/BA/FMIPA/CI
Tgl. : 16 - 6 - '09

STATISTICS STUDY PROGRAM OF MATHEMATICS DEPARTMENT
MATHEMATICS AND SCIENCE FACULTY
DIPONEGORO UNIVERSITY
SEMARANG
2007

TEACHING-LEARNING CONTRACT

COURSE TITLE : QUEUEING THEORY
CODE : PAS 127
CREDIT : 3 SKS
Semester : VI

1. Course Advantage

The queue is always happened in so many everyday life area. To get the optimal service, it is surely needed a correct method according to the condition and situation at queue type that happened. Determination of amount of server is very important to get a maximal result, either from the facet satisfaction and also from the expense optimization. Thereby queue theory become a knowledge which useful in determination of policy of the problem.

2. Course Description

Queueing Theory load assortedly of queue model with its solution to get optimal result of satisfaction facet and also efficiency of its expense. Poisson and exponential distribution used as elementary assumption at queue problem. Various model studied relate to arrival pattern and many server used for the service. The Queue type also determined by the amount of channel which must be passed. By using the theory at stochastic process and markov chain, it expected will be obtained the queueing with lay time and optimal queue amount.

3. General Instructional Aim

After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method

4. Lecture Strategic

This lecturing uses three way teaching methods, that is lecturing, discuss, and practical work. Lecturing is given to explain the basic theories and followed by discussing some examples that illustrates its applications. To enrich knowledge, practical work is done after the theory was studied

5. References

- Gross, D. and Harris, C.M., 1998, *Fundamentals of Queuing Theory*, 3rd edition, John Wiley & Sons, Inc., New York
- Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey
- Taha, H.A., 1997, *Riset Operasi*, Binarupa Aksara, Jakarta

6. Task

- Quiz will be given after two chapter have finished
- Task is done self-supportingly
- Midterm and final exam are given with open book system

7. Scoring Criteria

Criteria of scoring in this course is

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

In determining the final score, it will be used the following weight :

Task & Quiz	20 %
Midterm	30 %
Final Exam	50 %

8. Lecture Schedule

Week	Material	Reference
1	Introduction Bases of Queueing Theory	Gross, Chapter 1.1 - 1.6.; Render, Chapter 14.1; 14.2; Taha, Chapter 15.1
2	Stochastic Process and Markov Chain	Gross, Chapter 1.7 - 1.9, Render, Chapter 14.3; Taha Chapter 15.2
3	Steady-State Solution for M/M/1 Model Task I	Gross Chapter 1.10., 2.1.; Render 14.4, Taha Chapter 15.4
4	Differenceal Equation at Steady-State Quiz I	Gross, Chapter 2.2

5	Queue with Paralel Chanel (M/M/c)	Gross, Chapter 2.3.; Taha, Chapter 15.5; Render, Chapter 14.5
6	Queue Model M/M/c/K and M/M/c/c	Gross, Chapter 2.4, 2.5;
7	Midterm	
8	Some Other Steady-State Queue Model	Gross, Chapter 2.6 – 2.9; Renders, Chapter 14.6 - 14.8; Taha, Chapter 15.6; 15.6
9	Bulk Input and Bulk Service	Gross, Chapter 3.1, 3.2;
10	Erlangian Model Tugas II	Gross, Chapter 3.3;
11	Series and Network Queue Quiz II	Gross, Chapter 4.1 – 4.3; Taha, Chapter 15.8
12	Single Server Model	Gross, Chapter 5.1; Taha, Chapter 15.7
13	Multi Server Model	Gross, Chapter 5.2, 5.3;
14	Final Exam	

**LEARNING PROGRAM OUTLINE
(LPO)**

Course Title : Queuing Theory
 Code / Credit : PAS 127 / 3 SKS
 Course Description : Queue Theory load assortedly of queue model with its solution to get optimal result of satisfaction facet and also efficiency of its expense. Poisson and exponential distribution are used as elementary assumption at problem of queue. Various model studied relate to arrival pattern and many server used for the service. Queue type is also determined by amount of channel which must be passed. By using theory at stochastic process and markov chain expected will be obtained a queue with lay time and optimal queue amount.

General Instructional Aim : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.

No.	Specific Instructional Aim	Subject	Sub Subject	Duration	References
1.	After studying this subject the student are expected can recognize some characteristic of queue process, elementary term and notation which used.	Introduction of Queueing Theory	<ul style="list-style-type: none"> • Introduction of Queueing Theory 	150 minutes	[1] 1 – 15 [2] 649 – 652 [3] 176 – 178
2.	After studying subject the student are expected to know the stochastic process and also discrete and continue markov chain and also can finish discrete and continue markov chain problem	Stochastic Process and Markov Chain	<ul style="list-style-type: none"> ▪ Stochastic Process and Markov Chain 	150 minutes	[1] 16 – 44 [3] 179 – 181
3.	After studying subject the student are expected to know all kinds of steady-state model and can finish the problem by chosening the correct method	The Models of Steady-State Queueing	<ul style="list-style-type: none"> ▪ Steady-State Solution for M/M/1 Model ▪ Differential Equation at Steady-State ▪ Queueing at (M/M/c) Paralel Chanel 	750 minutes	[1] 45 – 101 [2] 652 – 670 [3] 181 – 208

			<ul style="list-style-type: none"> ▪ (M/M/c/K) and (M/M/c/c) Queue Model ▪ Some other Queue Steady-State Model 		
4.	After studying subject the student are expected to know some advanced queue model and can finish the problem by chosening the correct method.	Advanced Queue Models	<ul style="list-style-type: none"> ▪ Bulk Input and Bulk Service ▪ Erlangian Model 	300 minutes	[1] 116 – 159 [3] 208 – 213
5.	After studying subject the student are expected to recognize the series and network queue and can finish the problem by chosening the correct method.	Series and Network Queue	<ul style="list-style-type: none"> ▪ Series and Network Queue 	150 minutes	[1] 165 – 198 [3] 213 – 218
6.	After studying subject the student are expected to finish the single server and multi server problem	Model with Service Pattern or General Arrival	<ul style="list-style-type: none"> • Single Server Queue • Multi Server Queue 	300 minutes	[1] 209 – 260 [2] 95 – 100 [3] 20 – 24

References :

1. Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York
2. Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey
3. Taha, H.A., 1997, *Riset Operasi*, Binarupa Aksara, Jakarta

LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 1

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.
2. SPECIFIC : After studying this subject, students are expected to have ability to explain some can recognize some characteristic of queue process, elementary terms and notations which be used.

B. SUBJECT : Basics of Queueing Theory

C. SUB SUBJECT : Introduction, Basics of Queueing Theory

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 1st meeting ▪ Explaining the description of queue problem ▪ Explaining the interest of GIA/SIA. 	Observing	OHP, transparancy
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining some characteristic of queue process and also the basic terms and notation ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparancy, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving comment of student's work ▪ Giving problems as practice at home ▪ Giving knowledge about lecturing items at the 2nd meeting 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT

: Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student

This instrument will be used at the next meeting

F. REFERENCES

: Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York

Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey

Taha, H.A., 1997, *Riset Operasi*, Binarupa Aksara, Jakarta

LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 2

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.

2. SPECIFIC : After studying subject the student are expected to know the stochastic process and also discrete and continue markov chain and also can finish discrete and continue markov chain problem

B. SUBJECT : Stochastic Process and Markov Chain

C. SUB SUBJECT : Stochastic Process and Markov Chain

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 2nd meeting ▪ Explaining Poisson process and Exponential distribution ▪ Explaining the interest of GIA/SIA. 	Observing	OHP, transparency
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining stochastic process and the discrete and continue of markov process ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparency, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving comment of student's work ▪ Giving problems as practice at home ▪ Giving knowledge about lecturing items at the 3rd meeting 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT

: Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student

This instrument will be used at the next meeting

F. REFERENCES

: Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York

Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey

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LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 3

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.

2. SPECIFIC : After studying subject the student are expected to finish the steady-state problem for M/M/1 model

B. SUBJECT : The Models of Steady-State Queueing

C. SUB SUBJECT : Steady-State Solution for M/M/1 Model

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 3rd meeting ▪ Explaining the basic concept of steady-state process ▪ Explaining the interest of GI/SIA. 	Observing	OHP, transparency
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining Steady-State solution for M/M/1 model ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparency, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving comment of student's work ▪ Giving problems as practice at home ▪ Giving knowledge about lecturing items at the 4th meeting 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT

: Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student

This instrument will be used at the next meeting

F. REFERENCES

: Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York

Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey

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LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 4

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.

2. SPECIFIC : After studying subject the student are expected to recognizing some method to finish the problem of differensial equation of steady-state

B. SUBJECT : The Models of Steady-State Queueing

C. SUB SUBJECT : Differential Equation at the Steady-State

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 4th meeting ▪ Explaining the kinds of method to steady-state solution ▪ Explaining the interest of GIA/SIA. 	Observing	OHP, transparancy
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining the iterative method, generating functions and the use of operator ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparancy, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving comment of student's work ▪ Giving problems as practice at home ▪ Giving knowledge about lecturing items at the 5th meeting 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT

: Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student

This instrument will be used at the next meeting

F. REFERENCES

: Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York

Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey

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LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 5

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.

2. SPECIFIC : After studying subject the student are expected to finish the Chanel Paralel (M/M/c) problem

B. SUBJECT : The Models of Steady-State Queueing

C. SUB SUBJECT : Queueing at Paralel Chanel (M/M/c)

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 5th meeting ▪ Explaining the difference of M/M/c and M/M/1 ▪ Explaining the interest of GIA/SIA. 	Observing	OHP, transparency
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining some characteristic queue model with parallel chanel, the used formulas and the way to workmanship ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparency, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving comment of student's work ▪ Giving problems as practice at home ▪ Giving knowledge about lecturing items at the 6th meeting ▪ Giving Quiz as an evaluation 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT

: Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student

This instrument will be used at the next meeting

F. REFERENCES

: Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York

Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey

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LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 6

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.

2. SPECIFIC : After studying subject the student are expected to finish the $M/M/c/K$ dan $M/M/c/c$ problem

B. SUBJECT : The Models of Steady-State Queueing

C. SUB SUBJECT : $M/M/c/K$ and $M/M/c/c$ Model

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 6th meeting ▪ Explaining the relation of $M/M/c$ with $M/M/c/K$ concept ▪ Explaining the interest of GIA/SIA. 	Observing	OHP, transparency
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining concept and way of solving of the problem of $M/M/C/K$ model and of $M/M/C/C$ as special case of $M/M/C/K$ ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparency, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving comment of student's work ▪ Giving problems as practice at home ▪ Giving knowledge about lecturing items at the 7th meeting 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT

: Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student

This instrument will be used at the next meeting

F. REFERENCES

: Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York

Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey

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LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 8

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.
2. SPECIFIC : After studying subject the student are expected to recognize some queue model and can finish the queue problem with the correct model.

B. SUBJECT : The Models of Steady-State Queueing

C. SUB SUBJECT : Some other Queue Steady-State Model

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 8th meeting ▪ Explaining another conducive queueing model ▪ Explaining the interest of GIA/SIA. 	Observing	OHP, transparency
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining the queueing with unlimited service, finite source, state dependent service and impatience ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparency, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving comment of student's work ▪ Giving problems as practice at home ▪ Giving knowledge about lecturing items at the 9th meeting 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT

: Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student

This instrument will be used at the next meeting

F. REFERENCES

: Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York

Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey

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LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 9

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.

2. SPECIFIC : After studying subject the student are expected to finish queue problem that is Bulk Input ($M^X/M/1$) and Bulk Service ($M/M^Y/1$) model.

B. SUBJECT : Models of Advanced Queueing

C. SUB SUBJECT : Bulk Input and Bulk Service

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 9th meeting ▪ Explaining the interest of GIA/SIA. 	Observing	OHP, transparency
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining concept and formula of Bulk Input and Bulk Service model ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparency, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving task of practical work ▪ Giving knowledge about lecturing items at the next meeting 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT : Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student
 This instrument will be used at the next meeting

F. REFERENCES

- : Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York
- Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey
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LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 10

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.

2. SPECIFIC : After studying subject the student are expected to finish queue problem that is Erlangian model.

B. SUBJECT : Models of Advanced Queueing

C. SUB SUBJECT : Erlangian Model

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 10th meeting ▪ Explaining concept of Erlang distribution ▪ Explaining the interest of GIA/SIA. 	Observing	OHP, transparency
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining queue model with the Erlang service and the Erlang arrival ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparency, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving task of practical work ▪ Giving knowledge about lecturing items at the next meeting 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT : Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student
 This instrument will be used at the next meeting

F. REFERENCES

- : Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York
- Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey
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LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 11

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.

2. SPECIFIC : After studying subject the student are expected to finish queue problem that is Series and Jackson Network model.

B. SUBJECT : Series and Network Queueing

C. SUB SUBJECT : Series and Network Queueing

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 11th meeting ▪ Explaining the basic concept of network and series at queueing model ▪ Explaining the interest of GI/SIA. 	Observing	OHP, transparancy
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining concept and formula of series queueing and Jackson Network ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparancy, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving task of practical work ▪ Giving knowledge about lecturing items at the next meeting ▪ Giving Quiz as an evaluation 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT

: Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student

This instrument will be used at the next meeting

F. REFERENCES

: Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York

Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey

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LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 12

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.

2. SPECIFIC : After studying subject the student are expected to finish the single server problem

B. SUBJECT : Model with Service Pattern or General Arrival

C. SUB SUBJECT : Single Server Queueing

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 12th meeting ▪ Explaining Poisson input and Markov process that be used ▪ Explaining the interest of GIA/SIA. 	Observing	OHP, transparency
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining single server queue model with Poisson input and general service (M/G/1) ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparency, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving comment of student's work ▪ Giving problems as practice at home ▪ Giving knowledge about lecturing items at the 13th meeting 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT

: Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student

This instrument will be used at the next meeting

F. REFERENCES

: Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York

Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey

Taha, H.A., 1997, *Riset Operasi*, Binarupa Aksara, Jakarta

LEARNING UNIT PROGRAM (LUP)

COURSE TITLE : QUEUEING THEORY

CODE / CREDIT : PAS 127 / 3 SKS

DURATION : 150 MINUTES

WEEK : 13

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected can to recognize various queue model, and also finish the problem of queue with correct method.
2. SPECIFIC : After studying subject the student are expected to finish the multi server problem

B. SUBJECT : Model with Service Pattern or General Arrival

C. SUB SUBJECT : Multi Server Queueing

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ul style="list-style-type: none"> ▪ Explaining items coverage to reach at the 13th meeting ▪ Explaining the interest of GIA/SIA. 	Observing	OHP, transparency
PRESENTATION	<ul style="list-style-type: none"> ▪ Explaining multiserver queue model with Poisson input and general service ▪ Explaining the general service and exponential service ▪ Giving example ▪ Giving similar practice and show the student to finish 	Observing Asking which not have been comprehended Paying attention Asking which not have been comprehended Active do	OHP, transparency, white board white board paper
CLOSING	<ul style="list-style-type: none"> ▪ Giving a task as an exercise ▪ Giving knowledge about the conclusion of all course items 	Answering To Discussion Noting Noting Paying attention	White board paper paper

E. ASSESSMENT : Giving problems to be done self-supportingly to evaluate do items the given have been comprehended by the student

F. REFERENCES

- : Gross, D. and Harris, C.M., *Fundamentals of Queuing Theory*, 3rd edition, 1998, John Wiley & Sons, Inc., New York
- Render, B. and Stair, JR., A.M., 1997, *Quantitative Analysis for Management*, 6th edition, Prentice Hall, Inc., New Jersey
- Taha, H.A., 1997, *Riset Operasi*, Binarupa Aksara, Jakarta