TEACHING-LEARNING CONTRACT

LEARNING PROGRAM OUTLINE

LEARNING UNIT PROGRAM

INTRODUCTION TO RELIABILITY THEORY

PAS 140

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

TEACHING-LEARNING CONTRACT

Course Title : Introduction to Reliability Theory
Code : PAS 140
Credit : 3
Semester : VI

1. Course Advantage

Two features contribute to the usefulness of this course: every theoretical development discussed of this course is followed by an engineering example that illustrates its applications, and several problems are included at the end of this course. It can be adapted for use in a life data analysis course offered in undergraduate programs in statistics.These features increase the usefulness of this course as both a comprehensive reference for practitioners and professionals in the quality and reliability engineering area and also as a course on reliability engineering for senior undergraduate students in industrial and systems, mechanical, and electrical engineering programs.

2. Course Description

Reliability is one of the most important quality characteristics of components, products, and large and complex systems.This course is organized according to the sequence followed when engineers design a product or service. It is covered on the basics definitions of reliability, its measures, and methods for its calculations; discusses time-and failure dependent reliability and calculation of Mean Time To Failure (MTTF) of a variety of system configurations; and provides a comprehensive coverage of parametric and nonparametric reliability for failure data. This course needs a background in statistics and probability theory and differential calculus.

3. General Instructional Aim

After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.

4. Lecture Strategic

This lecturing uses four teaching methods, these are lecturing, discuss, presentation, and practice at computer laboratory. Lecturing is given to explain the basic theories and followed by discussing some examples that illustrates its applications. To enrich knowledge, group task will be presented in the class, and students will be discussion intensively. And for giving computer skills on reliability analysis, students practice some reliability problems with RELEST software.

5. References

1. Bain, L.J. dan Engelhardt, M., 1992, *Introduction to Probability and Mathematical Statistics*, second edition, Duxbury Press, USA.
2. Di Asih I Maruddani and Triastuti Wuryandari, 2006, *Modul Pelatihan Teknik Pengolahan Data dan Analisis Reliabilitas*, Matematics Department Mathematics and Natural Sciences Faculty, Diponegoro University, Semarang.
3. Elsayed, E.A., 1996, *Reliability Engineering*, Addison Wesley Longman, Inc, Reading, Massachusetts.
4. Lawless, J.F., 1982, *Statistical Model and Methods for Lifetime Data,* John Wiley and Sons, Inc. Canada.
5. Lee, E.T., 1992, *Statistical Methods for Survival Data Analysis,* John Wiley and Sons, Inc Canada.
6. Mann, N.R., Schafer, R.E., dan Singpurwala, N.D., 1974, *Methods for Statistical Analysis of Reliability and Life Data*, John Wiley & Sons, New York.

6. 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

Scoring in this course title consist of three component, that is task, quiz, and examination. Examination will be held twice, that is mid-term and final exam. Midterm exam is arranged after seventh lecturing, while final exam item is arranged after fourteenth lecturing. Tasks consist of individual task and group task. Quiz is unscheduled programs. Task will be given for two ways, these are individual task and group task.

Final score decision is based on this scoring indicator such as:

No	Component	Percentage
1.	Quiz	10 %
2.	Group Task and Individual Task	20 %
3.	Midterm	30 %
4.	Final Exam	40 %
	TOTAL	**100%**

9. Lecture Schedule

Week	Material	Reference
1	Introduction to Reliability Theory, Failure Time Distributions and Estimation Methods.	Elsayed (1996) Bain et al (1992)
2	The Basics of Reliability and Hazard Function Task I (Individual Task)	Elsayed (1996) Mann (1974)
3	Mean Time to Failure (MTTF) and Mean Residual Life (MRL)	Elsayed (1996) Mann (1974)
4	Parametric Reliability Models: Exponential Distribution dan Rayleigh Distribution Task II (Group Task)	Elsayed (1996) Mann (1974)
5	Parametric Reliability Models: Weibull Distribution and Gamma Distribution	Elsayed (1996) Mann (1974)
6	Practice at computer laboratory	Di Asih I Maruddani (2006)
7	Presentation of Group Task	
8	Midterm	
9	Presentation of Group Task	
10	One Sample Nonparametric Reliability Models : Kaplan-Meier Methods	Lee (1992) Lawless (1982)
11	One Sample Nonparametric Reliability Models : Life-Table Analysis	Lee (1992) Lawless (1982)
12	Two Sample Nonparametric Reliability Models : Gehan's Test, Cox-Mantel Test	Lee (1992) Lawless (1982)
13	One Sample Nonparametric Reliability Models : Logrank Test, Peto and Peto Test Task III (Individual Task)	Lee (1992) Lawless (1982)
14	One Sample Nonparametric Reliability Models : Cox's F Test	Lee (1992) Lawless (1982)
15	Practice at computer laboratory	Di Asih I Maruddani (2006)

16	Final Exam	

LEARNING PROGRAM OUTLINE

Course Title : Introduction to Reliability Theory

Code / Credit : PAS 140 / 3

Course Description : Reliability is one of the most important quality characteristics of components, products, and large and complex systems.This course is organized according to the sequence followed when engineers design a product or service. It is covered on the basics definitions of reliability, its measures, and methods for its calculations; discusses time-and failure dependent reliability and calculation of Mean Time To Failure (MTTF) of a variety of system configurations; and provides a comprehensive coverage of parametric and nonparametric reliability for failure data. This course needs a background in statistics and probability theory and differential calculus.

General Instructional Aim : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.

No.	Specific Instructional Aim	Subject	Sub Subject	Duration	References
1	After studying this course, students are expected to have ability to: explain some basics definitions of reliability and hazard functions; know, use and differentiate between some failure time distributions; use some estimation methods for estimating parameters of failure time distributions	Introduction to Reliability Theory	▪ Introduction ▪ Reliability Definitions and Hazard Functions ▪ Failure Time Distributions ▪ Estimation Methods of the Parameters of Failure Time Distribution	150 minutes	[1] and [3]
2	After studying this course, students are expected to have ability to construct one basic reliability function from the three basics fuctions and estimate the four basics	The Basics of Reliability Function and Hazard Function	▪ Failure Density Function, $f(t)$ ▪ Cumulative Probability Function, $F(t)$ ▪ Reliability	150 minutes	[3] and [6]

	reliability function in many distribution functions.		Function, $R(t)$ ▪ Hazard Rate Function, h (t)		
3	After studying this course, students are expected to have ability to explain time and failure dependent reliability and calculation the Mean Time To Failure (MTTF) and Mean Residual Life (MRL) of variety of systems configurations	Mean Time to Failure (MTTF) and Mean Residual Life (MRL)	▪ Mean Time to Failure (MTTF) for Series Systems ▪ Mean Time to Failure (MTTF) for Parallel Systems ▪ Mean Residual Life (MRL)	150 minutes	[3] and [6]
4	After studying this course, students are expected to have ability to: explain types of data censoring; analyze failure data with censoring and failure data without censoring data of special distribution	Parametric Reliability Models	▪ Types of Censoring ▪ Exponential Distribution ▪ Rayleigh Distribution ▪ Weibull Distribution ▪ Gamma Distribution	300 minutes	[3] and [6]
5	After practicing some problems at computer laboratory, students are excpected to have ability to analyze parametric reliability problems with RELEST Software.	Practice of Parametric Reliability Models	▪ Exponential Distribution ▪ Weibull Distribution ▪ LogNormal Distribution	150 minutes	[2]
6	After studying this course, students are expected to have ability to use Kaplan Meier Methods and Life-Table Analysis to calculate one sample failure data	One Sample Nonparametric Reliability Models	▪ Kaplan-Meier Methods ▪ Life Table Analysis	300 minutes	[4] and [5]
7	After studying this course, students are expected to have ability to use Kaplan Meier Methods and Life-Table Analysis to calculate one	Two Sample Nonparametric Reliability Models	▪ Gehan's Test ▪ Cox-Mantel Test ▪ Logrank Test ▪ Peto and Peto Test ▪ Cox's F Test	450 minutes	[4] and [5]

	sample failure data				
8	After practicing some problems at computer laboratory, students are excpected to have ability to analyze nonparametric reliability problems with RELEST Software.	Practice of Nonparametric Reliability Models	▪ One Sample Nonparametric Reliability Models ▪ Two Sample Nonparametric Reliability Models	150 minutes	[2]

References

1. Bain, L.J. dan Engelhardt, M., 1992, *Introduction to Probability and Mathematical Statistics*, second edition, Duxbury Press, USA.
2. Di Asih I Maruddani and Triastuti Wuryandari, 2006, *Modul Pelatihan Teknik Pengolahan Data dan Analisis Reliabilitas*, Matematics Department Mathematics and Natural Sciences Faculty, Diponegoro University, Semarang.
3. Elsayed, E.A., 1996, *Reliability Engineering*, Addison Wesley Longman, Inc, Reading, Massachusetts.
4. Lawless, J.F., 1982, *Statistical Model and Methods for Lifetime Data*, John Wiley and Sons, Inc. Canada.
5. Lee, E.T., 1992, *Statistical Methods for Survival Data Analysis*, John Wiley and Sons, Inc Canada.
6. Mann, N.R., Schafer, R.E., dan Singpurwala, N.D., 1974, *Methods for Statistical Analysis of Reliability and Life Data*, John Wiley & Sons, New York.

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY

CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 1

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After studying this course, students are expected to have ability to: explain some basics definitions of reliability and hazard functions; know, use and differentiate between some failure time distributions; use some estimation methods for estimating parameters of failure time distributions

B. SUBJECT : Introduction to Reliability Theory

C. SUB SUBJECT : Introduction, Reliability Definitions and Hazard Functions, Failure Time Distributions, Estimation Methods of the Parameters of Failure Time Distribution

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 1st meeting ▪ Describing about general and specific objectives competence ▪ Explaining definition and concept of reliability theory	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Explaining about some life-time distribution: Gamma, Exponential, Weibull, Rayleigh, and Normal, followed by explain the procedure to estimate parameters with method of momen and method of maximum likelihood.	Observing, asking, taking notes	OHP, transparancy, white board, reference books, and papers

	▪ Giving examples as a study case and solving together		
CLOSING	▪ Discussion ▪ Giving some problems as a homework ▪ Giving description about matter on the next meeting	Discuss, asking, observing, taking notes	white board and papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE :

1. Bain, L.J. dan Engelhardt, M., 1992, *Introduction to Probability and Mathematical Statistics*, second edition, Duxbury Press, USA.
2. Elsayed, E.A., 1996, *Reliability Engineering*, Addison Wesley Longman, Inc, Reading, Massachusetts.

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY

CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 2

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After studying this course, students are expected to have ability to construct one basic reliability function from the three basics fuctions and estimate the four basics reliability function in many distribution functions.

B. SUBJECT : The Basics of Reliability Function and Hazard Function

C. SUB SUBJECT : Failure Density Function, $f(t)$, Cumulative Probability Function, $F(t)$, Reliability Function, $R(t)$, Hazard Rate Function, $h(t)$

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 2nd meeting ▪ Describing about general and specific objectives competence ▪ Explaining reliability concept and hazard function	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Explaining about four basics function in reliability theory, that is Failure Density Function, $f(t)$, Cumulative Probability Function, $F(t)$, Reliability Function, $R(t)$, Hazard Rate Function, $h(t)$ ▪ Giving examples as a study case and solving together	Observing, asking, taking notes	OHP, transparancy, white board, reference books, and papers
CLOSING	▪ Discussion ▪ Giving Task I (Individual	Discuss, asking,	white board and papers

	Task) ▪ Giving description about matter on the next meeting	observing, taking notes	

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE :

1. Elsayed, E.A., 1996, *Reliability Engineering*, Addison Wesley Longman, Inc, Reading, Massachusetts.
2. Mann, N.R., Schafer, R.E., dan Singpurwala, N.D., 1974, *Methods for Statistical Analysis of Reliability and Life Data*, John Wiley & Sons, New York.

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY
CODE / CREDIT : PAS 140 / 3 SKS
DURATION : 150 MINUTES
WEEK : 3

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After studying this course, students are expected to have ability to explain time and failure dependent reliability and calculation the Mean Time To Failure (MTTF) and Mean Residual Life (MRL) of variety of systems configurations

B. SUBJECT : Mean Time to Failure (MTTF) and Mean Residual Life (MRL)

C. SUB SUBJECT : Mean Time to Failure (MTTF) for Series Systems, Mean Time to Failure (MTTF) for Parallel Systems, Mean Residual Life (MRL)

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 3rd meeting ▪ Describing about general and specific objectives competence ▪ Explaining concept of MTTF and MRL	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Explaining about the using of MTTF for series systems and parallel systems and MRL ▪ Giving examples as a study case and solving together	Observing, asking, taking notes	OHP, transparancy, white board, reference books, and papers
CLOSING	▪ Discussion ▪ Giving some problems as a homework ▪ Giving description about matter on the next meeting	Discuss, asking, observing, taking notes	white board and papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE :

1. Elsayed, E.A., 1996, *Reliability Engineering*, Addison Wesley Longman, Inc, Reading, Massachusetts.
2. Mann, N.R., Schafer, R.E., dan Singpurwala, N.D., 1974, *Methods for Statistical Analysis of Reliability and Life Data*, John Wiley & Sons, New York.

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY
CODE / CREDIT : PAS 140 / 3 SKS
DURATION : 150 MINUTES
WEEK : 4

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After studying this course, students are expected to have ability to: explain types of data censoring; analyze failure data with censoring and failure data without censoring data of special distribution

B. SUBJECT : Parametric Reliability Models

C. SUB SUBJECT : Types of Censoring, Exponential Distribution, Rayleigh Distribution

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 4th meeting ▪ Describing about general and specific objectives competence ▪ Explaining concept of parametric reliability distribution	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Explaining about the types of censoring data ▪ Explaining reliability problem with Exponential and Rayleigh Distribution and how to estimate the parameters ▪ Explaining the difference between exponential and Rayleigh distribution with other distributions ▪ Giving examples as a study	Observing, asking, taking notes	OHP, transparancy, white board, reference books, and papers

	case and solving together		
CLOSING	▪ Discussion ▪ Giving Task II (Group Task) ▪ Giving description about matter on the next meeting	Discuss, asking, observing, taking notes	white board and papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE :

1. Elsayed, E.A., 1996, *Reliability Engineering*, Addison Wesley Longman, Inc, Reading, Massachusetts.
2. Mann, N.R., Schafer, R.E., dan Singpurwala, N.D., 1974, *Methods for Statistical Analysis of Reliability and Life Data*, John Wiley & Sons, New York.

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY

CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 5

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After studying this course, students are expected to have ability to: explain types of data censoring; analyze failure data with censoring and failure data without censoring data of special distribution

B. SUBJECT : Parametric Reliability Models

C. SUB SUBJECT : Weibull Distribution, Gamma Distribution

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 5th meeting ▪ Describing about general and specific objectives competence ▪ Explaining concept of parametric reliability distribution	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Explaining about the types of censoring data ▪ Explaining reliability problem with Weibull and Gamma Distribution and how to estimate the parameters ▪ Explaining the difference between Weibull and Gamma distribution with other distributions ▪ Giving examples as a study case and solving together	Observing, asking, taking notes	OHP, transparancy, white board, reference books, and papers

CLOSING	▪ Discussion ▪ Giving some problems as a homework ▪ Giving description about matter on the next meeting	Discuss, asking, observing, taking notes	white board and papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE :

1. Elsayed, E.A., 1996, *Reliability Engineering*, Addison Wesley Longman, Inc, Reading, Massachusetts.
2. Mann, N.R., Schafer, R.E., dan Singpurwala, N.D., 1974, *Methods for Statistical Analysis of Reliability and Life Data*, John Wiley & Sons, New York.

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY

CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 6

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After practicing some problems at computer laboratory, students are excpected to have ability to analyze parametric reliability problems with RELEST Software.

B. SUBJECT : Practice of Parametric Reliability Models at Computer Laboratory

C. SUB SUBJECT : Exponential Distribution, Weibull Distribution, and LogNormal Distribution

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 6th meeting ▪ Describing about general and specific objectives competence	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Explaining the usage of RELEST functions	Observing, asking, taking notes	white board, reference books, papers, and computer
	▪ Giving some parametric reliability problems and solving the problems with RELEST	Observing, asking, taking notes	white board, reference books, papers, and computer
	▪ Giving problems with Exponential distribution, Weibull distribution, and LogNormal Distribution as a study case and students try to solve the problems with computer	Working with computer	computer

CLOSING	▪ Discussion ▪ Giving some problems as a homework ▪ Giving description about matter on the next meeting	Discuss and taking notes	white board and papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE : Di Asih I Maruddani and Triastuti Wuryandari, 2006, *Modul Pelatihan Teknik Pengolahan Data dan Analisis Reliabilitas*, Matematics Department Mathematics and Natural Sciences Faculty, Diponegoro University, Semarang.

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY

CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 7

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After following the discussion about reliability problems from the presentation of group task, students are expected to use the application of reliability problems for daily problems, and students are expected to have ability to communicate at class discussion.

B. SUBJECT : Presentation of Group Task

C. SUB SUBJECT : Discussion

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 7th meeting ▪ Describing about general and specific objectives competence	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ As a moderator of the discussion	Class Discussion	OHP, transparancy, white board, reference books, papers
CLOSING	▪ Giving some comments of the class discussion ▪ Giving some clues for midterm	Discuss and taking notes Taking notes	white board and papers papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE : -

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY

CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 9

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After following the discussion about reliability problems from the presentation of group task, students are expected to use the application of reliability problems for daily problems, and students are expected to have ability to communicate at class discussion.

B. SUBJECT : Presentation of Group Task

C. SUB SUBJECT : Discussion

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 9th meeting ▪ Describing about general and specific objectives competence	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ As a moderator of the discussion	Class Discussion	OHP, transparancy, white board, reference books, papers
CLOSING	▪ Giving some comments of the class discussion ▪ Giving some clues for midterm	Discuss and taking notes Taking notes	white board and papers papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE : -

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY

CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 10

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After studying this course, students are expected to have ability to use Kaplan Meier Methods and Life-Table Analysis to calculate one sample failure data

B. SUBJECT : One Sample Nonparametric Reliability Models

C. SUB SUBJECT : Kaplan-Meier Methods

D. TEACHING-LEARNING ACTIVITIES

STAGE	**LECTURER ACTIVITIES**	**STUDENT ACTIVITIES**	**LEARNING MEDIA**
INTRODUCTION	▪ Describing about matter at the 10th meeting ▪ Describing about general and specific objectives competence ▪ Explaining definition and concept of nonparametric reliability models	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Explaining about one sample nonparametric models ▪ Exlaining about Kaplan-Meier Methods ▪ Giving examples as a study case and solving together	Observing, asking, taking notes	OHP, transparancy, white board, reference books, and papers
CLOSING	▪ Discussion ▪ Giving some problems as a homework ▪ Giving description about matter on the next meeting	Discuss, asking, observing, taking notes	white board and papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE :

1. Lawless, J.F., 1982, *Statistical Model and Methods for Lifetime Data*, John Wiley and Sons, Inc. Canada.
2. Lee, E.T., 1992, *Statistical Methods for Survival Data Analysis*, John Wiley and Sons, Inc Canada.

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COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY

CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 11

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After studying this course, students are expected to have ability to use Kaplan Meier Methods and Life-Table Analysis to calculate one sample failure data

B. SUBJECT : One Sample Nonparametric Reliability Models

C. SUB SUBJECT : Life-Table Analysis

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 11th meeting ▪ Describing about general and specific objectives competence	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Exlaining about Kaplan-Meier Methods ▪ Giving examples as a study case and solving together	Observing, asking, taking notes	OHP, transparancy, white board, reference books, and papers
CLOSING	▪ Discussion ▪ Giving some problems as a homework ▪ Giving description about matter on the next meeting	Discuss, asking, observing, taking notes	white board and papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE : 1. Lawless, J.F., 1982, *Statistical Model and Methods for Lifetime Data*, John Wiley and Sons, Inc. Canada.

2. Lee, E.T., 1992, *Statistical Methods for Survival Data Analysis*, John Wiley and Sons, Inc Canada.

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CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 12

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After studying this course, students are expected to have ability to use Kaplan Meier Methods and Life-Table Analysis to calculate one sample failure data

B. SUBJECT : Two Sample Nonparametric Reliability Models

C. SUB SUBJECT : Gehan's Test and Cox-Mantel Test

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 12th meeting ▪ Describing about general and specific objectives competence	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Explaining about two sample nonparametric models ▪ Exlaining about Gehan's Test and Cox-Mantel Test ▪ Giving examples as a study case and solving together	Observing, asking, taking notes	OHP, transparancy, white board, reference books, and papers
CLOSING	▪ Discussion ▪ Giving some problems as a homework ▪ Giving description about matter on the next meeting	Discuss, asking, observing, taking notes	white board and papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE :

1. Lawless, J.F., 1982, *Statistical Model and Methods for Lifetime Data,* John Wiley and Sons, Inc. Canada.
2. Lee, E.T., 1992, *Statistical Methods for Survival Data Analysis,* John Wiley and Sons, Inc Canada.

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY

CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 13

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After studying this course, students are expected to have ability to use Kaplan Meier Methods and Life-Table Analysis to calculate one sample failure data

B. SUBJECT : Two Sample Nonparametric Reliability Models

C. SUB SUBJECT : Logrank Test, Peto and Peto Test

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 13th meeting ▪ Describing about general and specific objectives competence	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Exlaining about Logrank Test and Peto and Peto Test ▪ Giving examples as a study case and solving together	Observing, asking, taking notes	OHP, transparancy, white board, reference books, and papers
CLOSING	▪ Discussion ▪ Giving Task III (Individual Task) ▪ Giving description about matter on the next meeting	Discuss, asking, observing, taking notes	white board and papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE : 1. Lawless, J.F., 1982, *Statistical Model and Methods for Lifetime Data*, John Wiley and Sons, Inc. Canada.

2. Lee, E.T., 1992, *Statistical Methods for Survival Data Analysis*, John Wiley and Sons, Inc Canada.

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY

CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 14

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After studying this course, students are expected to have ability to use Kaplan Meier Methods and Life-Table Analysis to calculate one sample failure data

B. SUBJECT : Two Sample Nonparametric Reliability Models

C. SUB SUBJECT : Cox's F Test

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 14th meeting ▪ Describing about general and specific objectives competence	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Exlaining about Cox's F Test ▪ Giving examples as a study case and solving together	Observing, asking, taking notes	OHP, transparancy, white board, reference books, and papers
CLOSING	▪ Discussion ▪ Giving some clues for final exam	Discuss, asking, observing, taking notes	white board and papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE :

1. Lawless, J.F., 1982, *Statistical Model and Methods for Lifetime Data*, John Wiley and Sons, Inc. Canada.
2. Lee, E.T., 1992, *Statistical Methods for Survival Data Analysis*, John Wiley and Sons, Inc Canada.

LEARNING UNIT PROGRAM

COURSE TITLE : INTRODUCTION TO RELIABILITY THEORY

CODE / CREDIT : PAS 140 / 3 SKS

DURATION : 150 MINUTES

WEEK : 15

A. INSTRUCTIONAL AIM :

1. GENERAL : After studying this course, the student are expected to be able to explain the basics of life-time analysis with parametric and nonparametric methods.
2. SPECIFIC : After practicing some problems at computer laboratory, students are excpected to have ability to analyze nonparametric reliability problems with RELEST Software.

B. SUBJECT : Practice of Nonparametric Reliability Models at Computer Laboratory

C. SUB SUBJECT : 1. One Sample Nonparametric Reliability Models
2. Two Sample Nonparametric Reliability Models

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENT ACTIVITIES	LEARNING MEDIA
INTRODUCTION	▪ Describing about matter at the 15th meeting ▪ Describing about general and specific objectives competence	Observing and taking notes	OHP, transparancy, white board, reference books, and papers
PRESENTATION	▪ Explaining the usage of RELEST functions for nonparametric models	Observing, asking, taking notes	white board, reference books, papers, and computer
	▪ Giving some nonparametric reliability problems and solving the problems with RELEST	Observing, asking, taking notes	white board, reference books, papers, and computer
	▪ Giving problems with one sample and two sample nonparametric reliability models as a study case and students try to solve the	Working with computer	computer

	problems with computer		
CLOSING	▪ Discussion ▪ Giving some problems as a homework	Discuss and taking notes	white board and papers

E. EVALUATION : From the discussion, teacher can evaluate student's ability of understanding the theory.

F. REFERENCE : Di Asih I Maruddani and Triastuti Wuryandari, 2006, *Modul Pelatihan Teknik Pengolahan Data dan Analisis Reliabilitas*, Matematics Department Mathematics and Natural Sciences Faculty, Diponegoro University, Semarang.