

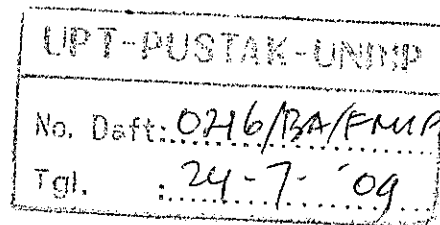
**STUDYING CONTRACT
LEARNING PROGRAM OUTLINE
LEARNING UNIT PROGRAM**

EXPERIMENTAL DESIGN

COURSE CODE: PAM 424

3 SCU

SEMESTER V



**MATHEMATICS STUDY PROGRAM
MATHEMATICS AND NATURAL SCIENCES FACULTY
DIPONEGORO UNIVERSITY
SEMARANG**

TEACHING – LEARNING CONTRACT

Course Title : Design of Experiments

Code : PAM 424

Credit : 3

Semester : 5

1. Course Advantage

This course is an applied statistics in research. Very useful to analyse a research at industrial, health, biological, agriculture, education area and the other area which need a research of attempt.

2. Course Description

This course have important of treatment design, respon design and design of environment for one factor and two factor design. One factor design include completely randomized design (CRD), randomized block design (RBD), Latin Square design. We will study to estimate parameter model, tables of anova, comparing means treatment, adequacy checking (homogeneity and normality of residual). Two factor design studied about factorial , and split plot design.

3. General Instructional Aim

After attend the lecture this student expected can chosen design matching with the problem of faced, analyse, checking model and conclude result of analysis.

4. Lecture Strategic.

To reach the target of this course this study system use two way teaching methods, that are lecturing and discussing. To increase the activity of student are given some assignation in the form of quiz in the class, and task that self done at home. This course is also performed by praktikum with program package are SAS 6.12 and minitab 13.

5. References

1. Montgomery, D.C. (2005). Design and Analysis of Experiments. 6nd Edition. John Willey & Sons. Inc.
2. Gasper , V (1991). Teknik Analisis dalam Penelitian Percobaan. Penerbit Tarsito, Bandung.
3. Stell, R.G.D and Torrie, J.H. (1991). Prinsip dan Prosedur Statistika: suatu pendekatan biometri. Penerbit PT Gramedia Pustaka Utama, Jakarta. (Alih bahasa : Ir. Bambang Sumantri (Institut Pertanian Bogor)).
4. Tatik Widiharih (2007). Buku Ajar Rancangan Percobaan. Program Studi Statistika, Jurusan Matematika, FMIPA Undip
5. Tatik Widiharih (2007). Modul Praktikum Rancangan Percobaan. Laboratorium Matematika FMIPA UNDIP
6. -----, 1990. SAS/STAT User's Guide, Version 6, Fourth Edition. Volume 1. SAS Institute Inc. SAS Campus Drive. Cary, NC.27513. USA
7. -----, 1997 Experimental Design for Researchers, Department of Statistics, Faculty of Information and Mathematical Science, Massey University, Australian.

6. Scoring Criteria.

Criteria of scoring in this course is :

scoring	value
A	4.0
AB	3.5
B	3.0
BC	2.5
C	2.0
CD	1.5
D	1.0
DE	0.5
E	0.0

Determination of scoring criteria is used weighted such as :

No	Component	Percentage
1	Quiz	10
2	Self-done task	15
3	Praktikum	15

4	Midterm	25
5	Final exam	35

7. Lecture Schedule

week	Material	references
1	1. Teaching-learning contract 2. Introduction 3. Elementary principle of design experiments	[1] : 1-21 [2] : 1-22 [3] : 149-167 [4] : modul 1
2	Completely randomized design with is same number of observation, its analysis, comparing means, and adequacy checking.	[1] : 61-73 ; 76-108 [2] : 62-76;97-111;115-140 [3] : 168-178 [4] : modul 2 and 3
3	Completely randomized design with is unbalance data, its analysis, comparing means, and adequacy checking.	[1] : 75-108 [2] : 77-80 ; 115-140 [3] : 179-182 [4] : modul 2 and 3
4	Randomized block design include its analysis, comparing means, and adequacy checking.	[1] : 119-133 [2] : 198-209 [3] : 236-253 [4] : modul 3 and 4
5	Efisiensi relative, missing data for randomized block design.	[1] : 130-133 [2] : 209-217 [4] : modul 4
6	Latin square design include its analysis, comparing means, and adequacy checking.	[1] : 136-142 [2] : 231-260 [3] : 267-283 [4] : modul 5 and 3
7	Efisiensi relative, missing data for latin square design	[1] : 136-142 [2] : 231-260 [3] : 267-283 [4] : modul 5
8	Midterm	-
9	Praktikum 1	[5] Modul praktikum
10, 11	Two factor factorial design	[1] : 160-197 [2] : 317-395 [3] : 403-450 [4] : modul 6
12	Praktikum 2	[5] Modul praktikum
13, 14	Split plot design	[2] : 370-390 [3] : 451-470 [4] : modul 7
15	Praktikum 3	[5] Modul praktikum
16	Final exam	-

LEARNING PROGRAM OUTLINE

Course Title : Design of Experiments

Code : PAM 424

Credit : 3

Semester : 5

1. Course Description

This course have important of treatment design, respon design and design of environment for one factor and two factor design. One factor design include completely randomized design (CRD), randomized block design (RBD), Latin Square design. We will study to estimate parameter model, tables of anova, comparing means treatment, adequacy checking (homogeneity and normality of residual). Two factor design studied about factorial , and split plot design.

2. General Instructional Aim

After attend the lecture this student expected can chosen design matching with the problem of faced, analyse, checking model and conclude result of analysis.

No	Specific Instructional Aim	Subject	Sub Subject	duration	References
1	The students can to mention the aim, advantage and process of studying	Teaching – learning contract	General instructional aim, Relevance this course to another course, Evaluation and scoring criteria	1x50 minutes	-
2	Student can know importantly design of experiments of attempt in research.	Design of Experiments	Introduction. Principle of Design of Experiments	2x50 minutes	[1]:1-21 [2] :1-22 [3] : 149-167 [4] : modul 1
3	Students can compile anova table, comparing test of means, adequacy checking, giving node result of analysis for CRD (randomized design) .	Completely randomized design (CRD)	Usage of CRD) , fixed and random model, balanced and unbalanced data, comparing means, coefficient of variation, homogeneity and normality of residual,	6x50 minutes	[1] : 61-112 [2] : 62-114 [3] : 168-201 [4] : modul 2 and 3
4	Students can compile anova table, comparing test of means, adequacy checking, giving node result of analysis for randomized block	Randomized Block Design (RBD)	Usage of RBD, its manner analysis, homogeneity and normality of residual, comparing means, coefficient of variation, relative efisiensi, missing data.	6x50 minutes	[1] : 119-135 [2] : 198-230 [3] : 236-264 [4] : modul 4

	design (RBD).				
5	Students can compile anova table, comparing test of means, adequacy checking, giving node result of analysis for latin square design .	Latin Square Design	Usage of latin square design, its manner analysis, homogeneity and normality of residual, comparing means, coefficient of variation, relative effisiensi, missing data.	6x50 minutes	[1] : 136-142 [2] : 231-260 [3] : 267-283 [4] : modul 5
6	Students can compile anova table, comparing test of means, adequacy checking, giving node result of analysis for two factor factorial design	Factorial Design.	Principle two factor factorial design, Factorial in CRD, Factorial in RBD.	6x50 minutes	[1] : 160-197 [2] : 317-395 [3] : 403-450. [4] : modul 6
7	Students can compile anova table, comparing test of means, adequacy checking, giving node result of analysis for split plot design.	Split plot Design	Split plot in CRD Split plot in RBD	6x50 minutes	[2]:370-390 [3]:451-470 [4]: modul 7

References

1. Montgomery, D.C. (2005). Design and Analysis of Experiments. 6nd Edition. John Willey & Sons. Inc.
3. Gasper , V (1991). Teknik Analisis dalam Penelitian Percobaan. Penerbit Tarsito, Bandung.
3. Stell, R.G.D and Torrie, J.H. (1991). Prinsip dan Prosedur Statistika: suatu pendekatan biometri. Penerbit PT Gramedia Pustaka Utama, Jakarta. (Alih bahasa : Ir. Bambang Sumantri (Institut Pertanian Bogor)).
4. Tatik Widiharih (2007). Buku Ajar Rancangan Percobaan. Program Studi Statistika, Jurusan Matematika, FMIPA Undip
5. Tatik Widiharih (2007). Modul Praktikum Rancangan Percobaan. Laboratorium Matematika FMIPA UNDIP
6. -----, 1990. SAS/STAT User's Guide, Version 6, Fourth Edition. Volume 1. SAS Institute Inc. SAS Campus Drive. Cary, NC.27513. USA
7. -----, 1997 Experimental Design for Researchers, Department of Statistics, Faculty of Information and Mathematical Science, Massey University, Australian.

LEARNING UNIT PROGRAM

Course Title : Design of Experiments

Code : PAM 424

Credit : 3

Duration : 150 minutes

Week : 1

A. INSTRUCTIONAL AIM

1. General : After attend the lecture this student expected can chosen design matching with the problem of faced, analyse, checking model and conclude result of analysis..
2. Specific : Student can know importantly design of experiments of attempt in research.

B. SUBJECT : Design of Experiments

- C. SUB SUBJECT :**
1. Introduction
 2. Principle of design of experiments

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENTS ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ol style="list-style-type: none"> 1.Submitting teaching-learning contract 2. Explaining relevance this course with the other course 3.Explaining general aim 	Observing and taking notes	OHP, transparency White board
PRESENTATION	<ol style="list-style-type: none"> 1.Explaining principle design of experiment 2. Explaining how to choose a design. 3. Giving the example of applying and give task. 	Observing, asking, taking notes, doing task	OHP, transparency White board.
CLOSING	<ol style="list-style-type: none"> 1. Giving comment to work student. 2. Giving task to be done at home 	Answering to, discussion	White board

	3.Describing material at week 2.		
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E. ASSESSMENT : Giving problem to the students..

F. REFERENCES :

1. Gasper , V (1991). Teknik Analisis dalam Penelitian Percobaan. Penerbit Tarsito, Bandung.
- 2.. Montgomery, D.C. (2005). Design and Analysis of Experiments. 6nd Edition. John Willey & Sons. Inc.
3. Stell, R.G.D and Torrie, J.H. (1991). Prinsip dan Prosedur Statistika: suatu pendekatan biometri. Penerbit PT Gramedia Pustaka Utama, Jakarta. (Alih bahasa : Ir. Bambang Sumantri (Institut Pertanian Bogor)).
4. Tatik Widiharih (2007). Buku Ajar Rancangan Percobaan. Program Studi Statistika, Jurusan Matematika, FMIPA Undip

LEARNING UNIT PROGRAM

Course Title : Design of Experiments

Code : PAM 424

Credit : 3

Duration : 6x50 minutes

Week : 2, 3

A. INSTRUCTIONAL AIM

1. General : After attend the lecture this student expected can chosen design matching with the problem of faced, analyse, checking model and conclude result of analysis..
2. Specific : Students can compile anova table, comparing test of means, adequacy checking, giving node result of analysis for RD (randomized design).

B. SUBJECT : Completely Randomized Design (CRD)

C. SUB SUBJECT : 1. Usage of CRD (Completely Randomized Design)

2. Fixed and random model
3. Balanced and unbalanced data
4. Comparing means
5. Coefficient of variation.
6. Homogeneity and normality of residual,

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENTS ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ol style="list-style-type: none"> 1. Giving opportunity to student to ask previous items which not yet been mastered 2. Explaining relevance this section with previous section 3. Explaining the material for this 	Observing and taking notes	OHP, transparency White board

	section		
PRESENTATION	Explaining completely randomized design about : linear model, data layout, anova, comparing means, adequacy checking, coefficient of variation, follow the example of applying and give task.	Observing, asking, taking notes, doing task	OHP, transparency White board.
CLOSING	1. Giving comment to work student. 2. Giving task to be done at home 3. Describing material at next week	Answering to, discussion	White board

E. ASSESSMENT : Giving problem to the students..

F. REFERENCES :

1. Gasper , V (1991). Teknik Analisis dalam Penelitian Percobaan. Penerbit Tarsito, Bandung.
2. Montgomery, D.C. (2005). Design and Analysis of Experiments. 6nd Edition. John Willey & Sons. Inc.
3. Stell, R.G.D and Torrie, J.H. (1991). Prinsip dan Prosedur Statistika: suatu pendekatan biometri. Penerbit PT Gramedia Pustaka Utama, Jakarta. (Alih bahasa : Ir. Bambang Sumantri (Institut Pertanian Bogor)).
4. Tatik Widiharih (2007). Buku Ajar Rancangan Percobaan. Program Studi Statistika, Jurusan Matematika, FMIPA Undip.

LEARNING UNIT PROGRAM

Course Title : Design of Experiments

Code : PAM 424

Credit : 3

Duration : 6x50 minutes

Week : 4,5

A. INSTRUCTIONAL AIM

1. General : After attend the lecture this student expected can chosen design matching with the problem of faced, analyse, checking model and conclude result of analysis..
2. Specific : Students can compile anova table, comparing test of means, adequacy checking, giving node result of analysis for randomized block design (RBD).

B. SUBJECT : Randomized Block Design (RBD)

C. SUB SUBJECT : 1.Usage of RBD

2.Anova Table

3.Homogeneity and normality of residual,

4.Comparing means treatment

5.Coefficient of variation, relative efficiency,

6. Missing data in RBD

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENTS ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ol style="list-style-type: none">1. Giving opportunity to student to ask previous items which not yet been mastered2. Explaining relevance this section with previous section3.Explaining the material for this	Observing and taking notes	OHP, transparency White board

	section		
PRESENTATION	Explaining randomized block design (RBD) about : linear model, data layout, anova, comparing means, adequacy checking, coefficient of variation, relative efficiency, missing data, follow the example of applying and give task.	Observing, asking, taking notes, doing task	OHP, transparency White board.
CLOSING	1. Giving comment to work student. 2. Giving task to be done at home 3. Describing material at next week	Answering to, discussion	White board

E. ASSESSMENT : Giving problem to the students..

F. REFERENCES :

1. Gasper , V (1991). Teknik Analisis dalam Penelitian Percobaan. Penerbit Tarsito, Bandung.
- 2.. Montgomery, D.C. (2005). Design and Analysis of Experiments. 6nd Edition. John Willey & Sons. Inc.
3. Stell, R.G.D and Torrie, J.H. (1991). Prinsip dan Prosedur Statistika: suatu pendekatan biometri. Penerbit PT Gramedia Pustaka Utama, Jakarta. (Alih bahasa : Ir. Bambang Sumantri (Institut Pertanian Bogor)).
4. Tatik Widiharh (2007). Buku Ajar Rancangan Percobaan. Program Studi Statistika, Jurusan Matematika, FMIPA Undip

LEARNING UNIT PROGRAM

Course Title : Design of Experiments

Code : PAM 424

Credit : 3

Duration : 6x50 minutes

Week : 6,7

A. INSTRUCTIONAL AIM

1. General : After attend the lecture this student expected can chosen design matching with the problem of faced, analyse, checking model and conclude result of analysis..
2. Specific : Students can compile anova table, comparing test of means, adequacy checking, giving node result of analysis for latin square design .

B. SUBJECT : Latin Square Design

C. SUB SUBJECT : 1.Usage of Latin Square Design

2.Anova Table

3.Homogeneity and normality of residual

4.Comparing means treatment

5.Coefficient of variation, relative efficiency,

6. Missing data in Latin Square Design

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENTS ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ol style="list-style-type: none">1. Giving opportunity to student to ask previous items which not yet been mastered2. Explaining relevance this section with previous section3.Explaining the material for this section	Observing and taking notes	OHP, transparency White board

PRESENTATION	Explaining Latin Square design about : linear model, data layout, anova, comparing means, adequacy checking, coefficient of variation, relative efficiency, missing data, follow the example of applying and give task.	Observing, asking, taking notes, doing task	OHP, transparency White board.
CLOSING	1. Giving comment to work student. 2. Giving task to be done at home 3. Describing material at next week	Answering to, discussion	White board

E. ASSESSMENT : Giving problem to the students..

F. REFERENCES :

1. Gasper , V (1991). Teknik Analisis dalam Penelitian Percobaan. Penerbit Tarsito, Bandung.
- 2.. Montgomery, D.C. (2005). Design and Analysis of Experiments. 6nd Edition. John Willey & Sons. Inc.
3. Stell, R.G.D and Torrie, J.H. (1991). Prinsip dan Prosedur Statistika: suatu pendekatan biometri. Penerbit PT Gramedia Pustaka Utama, Jakarta. (Alih bahasa : Ir. Bambang Sumantri (Institut Pertanian Bogor)).
4. Tatik Widiharih (2007). Buku Ajar Rancangan Percobaan. Program Studi Statistika, Jurusan Matematika, FMIPA Undip

LEARNING UNIT PROGRAM

Course Title : Design of Experiments

Code : PAM 424

Credit : 3

Duration : 6x120 minutes

Week : 9,12,15

A. INSTRUCTIONAL AIM

1. General : After attend the lecture this student expected can chosen design matching with the problem of faced, analyse, checking model and conclude result of analysis..
2. Specific : After following this praktikum [of] student can use package of SAS 6.12 and minitab 13 to: making program, reading output and give node of done analysis.

B. SUBJECT : Praktikum

- C. SUB SUBJECT :**
1. Completely Randomized Design
 2. Randomized Block Design
 3. Latin Square Design
 4. Two Factor Factorial Design
 5. Split plot Design

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENTS ACTIVITIES	LEARNING MEDIA
INTRODUCTION	1.Submitting teaching-learning contract 2. Explaining relevance this course with the other course 3.Explaining general aim	Observing and taking notes	OHP, transparency White board
PRESENTATION	1.Explaining principle of package SAS 6.12 and minitab 2. Explaining GLM procedur for the :	Observing, asking, taking notes, doing task	OHP, transparency White board.

	contrast of, anova, comparing means, adequacy checking, output and this analysis.		
CLOSING	1. Giving comment to work student. 2. Giving task to be done at home 3. Describing material at next week	Answering to, discussion	White board

E. ASSESSMENT : Giving problem to the students..

F. REFERENCES :

1. -----, 1990. SAS/STAT User's Guide, Version 6, Fourth Edition. Volume 1. SAS Institute Inc. SAS Campus Drive. Cary, NC.27513. USA
2. -----, 1997 Experimental Design for Researchers, Department of Statistics, Faculty of Information and Mathematical Science, Massey University, Australian.
3. Tatik Widiharh (2007). Modul Praktikum Rancangan Percobaan. Laboratorium Matematika, FMIPA Undip.
4. Tatik Widiharh (2007). Buku Ajar Rancangan Percobaan. Program Studi Statistika Jurusan Matematika FMIPA Undip.

LEARNING UNIT PROGRAM

Course Title : Design of Experiments

Code : PAM 424

Credit : 3

Duration : 6x50 minutes

Week : 10,11

A. INSTRUCTIONAL AIM

1. General : After attend the lecture this student expected can chosen design matching with the problem of faced, analyse, checking model and conclude result of analysis..
2. Specific : Students can compile anova table, comparing test of means, adequacy checking, giving node result of analysis for two factor factorial design.

B. SUBJECT : Factorial Design

- C. SUB SUBJECT :**
1. Principle two factor factorial design
 2. Factorial in CRD.
 3. Factorial in RBD.

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENTS ACTIVITIES	LEARNING MEDIA
INTRODUCTION	<ol style="list-style-type: none"> 1. Giving opportunity to student to ask previous items which not yet been mastered 2. Explaining relevance this section with previous section 3. Explaining the material for this section 	Observing and taking notes	OHP, transparency White board
PRESENTATION	Explaining factorial design, two factor factorial design about : linear model, data	Observing, asking, taking notes, doing task	OHP, transparency White board.

	layout, anova, comparing means, adequacy checking, follow the example of applying and give task		
CLOSING	1. Giving comment to work student. 2. Giving task to be done at home 3. Describing material at next week	Answering to, discussion	White board

E. ASSESSMENT : Giving problem to the students..

F. REFERENCES :

1. Gasper , V (1991). Teknik Analisis dalam Penelitian Percobaan. Penerbit Tarsito, Bandung.
- 2.. Montgomery, D.C. (2005). Design and Analysis of Experiments. 6nd Edition. John Willey & Sons. Inc.
3. Stell, R.G.D and Torrie, J.H. (1991). Prinsip dan Prosedur Statistika: suatu pendekatan biometri. Penerbit PT Gramedia Pustaka Utama, Jakarta. (Alih bahasa : Ir. Bambang Sumantri (Institut Pertanian Bogor)).
4. Tatik Widiharih (2007). Buku Ajar Rancangan Percobaan. Program Studi Statistika, Jurusan Matematika, FMIPA Undip.

LEARNING UNIT PROGRAM

Course Title : Design of Experiments

Code : PAM 424

Credit : 3

Duration : 6x50 minutes

Week : 13,14

A. INSTRUCTIONAL AIM

1. General : After attend the lecture this student expected can chosen design matching with the problem of faced, analyse, checking model and conclude result of analysis..
2. Specific : Students can compile anova table, comparing test of means, adequacy checking, giving node result of analysis for split plot design.

B. SUBJECT : Split plot Design

C. SUB SUBJECT : 1. Split plot in CRD

2. Split plot in RBD

D. TEACHING-LEARNING ACTIVITIES

STAGE	LECTURER ACTIVITIES	STUDENTS ACTIVITIES	LEARNING MEDIA
INTRODUCTION	1. Giving opportunity to student to ask previous items which not yet been mastered 2. Explaining relevance this section with previous section 3. Explaining the material for this section	Observing and taking notes	OHP, transparency White board
PRESENTATION	Explaining split plot design about : linear model, data layout, anova, comparing	Observing, asking, taking notes, doing task	OHP, transparency White board.

	means, adequacy checking, follow the example of applying and give task		
CLOSING	1. Giving comment to work student. 2. Giving task to be done at home 3. Describing material for final exam	Answering to, discussion	White board

E. ASSESSMENT : Giving problem to the students..

F. REFERENCES :

1. Gasper , V (1991). Teknik Analisis dalam Penelitian Percobaan. Penerbit Tarsito, Bandung.
- 2.. Montgomery, D.C. (2005). Design and Analysis of Experiments. 6nd Edition. John Willey & Sons. Inc.
3. Stell, R.G.D and Torrie, J.H. (1991). Prinsip dan Prosedur Statistika: suatu pendekatan biometri. Penerbit PT Gramedia Pustaka Utama, Jakarta. (Alih bahasa : Ir. Bambang Sumantri (Institut Pertanian Bogor)).
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