TEACHING-LEARNING CONTRACT
LEARNING PROGRAM OUTLINE
LEARNING UNIT PROGRAM

ADVANCED DESIGN OF EXPERIMENTS
PAS 225

STATISTICS STUDY PROGRAM OF MATHEMATICS DEPARTMENT
MATHEMATICS AND SCIENCE FACULTY
DIPONEGORO UNIVERSITY
SEMARANG
2007
TEACHING – LEARNING CONTRACT

Course Title: Advanced Design of Experiments
Code : PAS 225
Credit : 3
Semester : 6

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. The analysis was discussed in this course as advanced analysis of variance, so that very needed by advanced researcher.

2. Course Description
   Election of design which is used in research, treatment in concerned, the number of respon, and aim of the research will determine needed analysis form. In this course will be studied about: subsampling design, regression approached for design of experiment, analysis of covariance, multivariate analysis of variance, repeated measurement design, split block design, 3-factor factorial design, split split plot design and split split block design.

3. General Instructional Aim
   After studying this course, the student are expected to be able to make analyse in the form of anova, anacova, manova and analysis for repeated measurement design.

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 assignment 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


7. ..........; (1997) Experimental Design for Researchers, Department of Statistics, Faculty of Information and Mathematical Science, Massey University, Australian.


Criteria of scoring in this course is:

<table>
<thead>
<tr>
<th>scoring</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0</td>
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<tr>
<td>AB</td>
<td>3.5</td>
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<td>B</td>
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<td>BC</td>
<td>2.5</td>
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<td>C</td>
<td>2.0</td>
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<td>CD</td>
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<td>DE</td>
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</table>
Determination of scoring criteria is used weighted such as:

<table>
<thead>
<tr>
<th>No</th>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>1</td>
<td>Quiz</td>
<td>10</td>
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<tr>
<td>2</td>
<td>Self-done task</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Praktikum</td>
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<td>4</td>
<td>Midterm</td>
<td>25</td>
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<tr>
<td>5</td>
<td>Final exam</td>
<td>35</td>
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</table>

7. Lecture Schedule

<table>
<thead>
<tr>
<th>week</th>
<th>Material</th>
<th>references</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1. Teaching-learning contract</td>
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<tr>
<td></td>
<td>• Randomized design</td>
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<tr>
<td></td>
<td>• 2 factor factorial design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Randomized design</td>
<td>[2] : 437-467</td>
</tr>
<tr>
<td></td>
<td>• Randomized block design</td>
<td>[3] : 574-467</td>
</tr>
<tr>
<td></td>
<td>• Latin square design</td>
<td>[4] : 107-110</td>
</tr>
<tr>
<td></td>
<td>• 2 factor Factorial design</td>
<td>188-193</td>
</tr>
<tr>
<td>7</td>
<td>Repeated measurement design</td>
<td>[6] : 342-370</td>
</tr>
<tr>
<td>9</td>
<td>Praktikum 1</td>
<td>[8] :</td>
</tr>
<tr>
<td>10</td>
<td>Split block design</td>
<td>[1] : 432-449</td>
</tr>
<tr>
<td>11&amp;12</td>
<td>3 factor factorial design:</td>
<td>[1] : 450-476</td>
</tr>
<tr>
<td></td>
<td>• Randomized design</td>
<td>[2] : 143-158</td>
</tr>
<tr>
<td></td>
<td>• Randomized block design</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Praktikum 2</td>
<td>[6] : [7], [8]</td>
</tr>
<tr>
<td>16</td>
<td>Final exam</td>
<td></td>
</tr>
</tbody>
</table>
LEARNING PROGRAM OUTLINE

Course Title : Advanced Design of Experiments
Code : PAS 225
Credit : 3
Semester : 6

Course Description

Election of design which is used in research, treatment in concerned, the number of respon, and aim of the research will determine needed analysis form. In this course will be studied about: sub sampling design, regression approached for design of experiment, analysis of covariance, multivariate analysis of variance, repeated measurement design, split block design, 3-factor factorial design, split plot design and split plot block design.

General Instructional Aim

After studying this course, the student are expected to be able to make analyse in the form of anova, anacova, manova and analysis for repeated measurement design.

<table>
<thead>
<tr>
<th>No</th>
<th>Specific Instructional Aim</th>
<th>Subject</th>
<th>Sub Subject</th>
<th>duration</th>
<th>References</th>
</tr>
</thead>
</table>
| 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 | 20 minutes | - |
| 2  | The Student can analyse for sub sampling design. | Sub sampling design | 1.Subsampling randomized design  
218-228  
| 3  | The students can detemine optimal point | Regression approached | - Regression approached for randomized desing  
- Regression approached for 2 factor factorial design | 6x50 minutes | [3] : 107-110  
188-193 |
| 4  | The student can analyse for analysis of covariance | Analysis of covariance | Analysis of covariance for:  
1. randomized design  
2. randomized block design | 6x50 minutes | [1] : 503-567  
[3] : 574-467 |
3. Latin square design
4. 2 factor factorial design

5. The students can analyse for multirespon design
   Manova
   Manova for:
   1. Randomized design
   2. Randomized block design
   3. General Manova
   3x50 minutes

6. The student can analyse for repeated measurement design
   Repeated measurement design
   1. Randomized in time
   2. Randomized block in time
   3. General repeated measurement
   3x50 minutes

7. The student can analyse for split block design
   Split block design
   1. Linear model
   2. Analysis of variance
   3. Comparing pairs of treatment means
   4. Adequacy checking
   3x50 minutes

8. The student can analyse for 3 factor design
   Three factor design
   1. 3 factor Factorial
   2. Split plot plot
   3. Split plot block
   12x50 minutes

References


7. ------------, 1997 Experimental Design for Researchers, Department of Statistics, Faculty of Information and Mathematical Science, Massey University, Australian.

LEARNING UNIT PROGRAM

Course Title : Advanced Design of Experiments
Code : PAS 225
Credit : 3
Duration : 150 minutes
Week : 1

A. INSTRUCTIONAL AIM

1. General : After studying this course, the student are expected to be able to make analyse in the form of anova, anacova, manova and analysis for repeated measurement design.

2. Specific : The Student can to make analyse for subsampling design

B. SUBJECT : Subsampling design

C. SUB SUBJECT : 1. Introduction
2. Subsampling randomized design
3. Subsampling randomized block design

D. TEACHING-LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>STAGE</th>
<th>LECTURER ACTIVITIES</th>
<th>STUDENT ACTIVITIES</th>
<th>LEARNING MEDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1. Submitting teaching-learning contract</td>
<td>Observing and taking notes</td>
<td>OHP, transparency</td>
</tr>
<tr>
<td></td>
<td>2. Explaining relevance this course with the other course</td>
<td></td>
<td>White board</td>
</tr>
<tr>
<td></td>
<td>3. Explaining general aim</td>
<td></td>
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</tr>
<tr>
<td>PRESENTATION</td>
<td>1. Explaining concept of subsampling</td>
<td>Observing, asking, taking notes, doing task</td>
<td>OHP, transparency</td>
</tr>
<tr>
<td></td>
<td>2. Explaining randomized design with subsampling</td>
<td></td>
<td>White board</td>
</tr>
<tr>
<td></td>
<td>about : linear model, data layout, anova, comparing means, adequacy checking,</td>
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<tr>
<td></td>
<td>follow the example of applying and give task.</td>
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</tr>
<tr>
<td></td>
<td>3. Explaining randomized block design with</td>
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</tbody>
</table>
### E. ASSESSMENT

Giving problem to the students.

### F. REFERENCES


LEARNING UNIT PROGRAM

Course Title : Advanced Design of Experiments
Code : PAS 225
Credit : 3
Duration : 6x50 minutes
Week : 2, 3

A. INSTRUCTIONAL AIM

1. General : After studying this course, the students are expected to be able
to make analyses in the form of anova, ancova, manova and
analysis for repeated measurement design.

2. Specific : The students can determine optimal point

B. SUBJECT : Regression approached

C. SUB SUBJECT : - Regression approached for randomized design
               - Regression approached for 2 factor factorial design

D. TEACHING-LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>STAGE</th>
<th>LECTURER ACTIVITIES</th>
<th>STUDENT ACTIVITIES</th>
<th>LEARNING MEDIA</th>
</tr>
</thead>
</table>
| INTRODUCTION| 1. Giving opportunity to students 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, transparancy White board |
|             |                                                                                     |                                     |                               |
| PRESENTATION| 1. Explaining relevance between regression with design
               2. Explaining orthogonal polinomial regression
               3. Explaining the way of determining order of regression pursuant to tables of anova
               4. Explaining the way of                                                    | Observing, asking, taking notes, doing task                                   | OHP, transparancy White board.   |
|             |                                                                                     |                                     |                               |
| Determining equation of regression  
5. Explaining the way of determining optimal point  
6. Giving example  
7. Giving task to be done student | Answering discussion to, White board |

CLOSING  
1. Giving comment to work student.  
2. Giving task to be done at home  
3. Describing material at next week

E. ASSESSMENT: Giving problem to the students.

F. REFERENCES:

LEARNING UNIT PROGRAM

Course Title: Advanced Design of Experiments
Code: PAS 225
Credit: 3
Duration: 6x50 minutes
Week: 4, 5

A. INSTRUCTIONAL AIM
1. General: After studying this course, the student are expected to be able to make analyse in the form of anova, anacova, manova and analysis for repeated measurement design.
2. Specific: The student can analyse for analysis of covariance

B. SUBJECT: Analysis of Covariance
C. SUB SUBJECT: Analysis of covariance for:
   1. Randomized design
   2. Randomized block design
   3. Latin square design
   4. 2 factor factorial design

D. TEACHING-LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>STAGE</th>
<th>LECTURER ACTIVITIES</th>
<th>STUDENT ACTIVITIES</th>
<th>LEARNING MEDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1. Giving opportunity to student to ask previous items which not yet been mastered</td>
<td>Observing and taking notes</td>
<td>OHP, transparancy White board</td>
</tr>
<tr>
<td></td>
<td>2. Explaining relevance this section with previous section</td>
<td></td>
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<tr>
<td></td>
<td>3. Explaining the material for this section</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>1. Explaining when anacova needed</td>
<td>Observing, asking, taking notes, doing task</td>
<td>OHP, transparancy White board.</td>
</tr>
<tr>
<td></td>
<td>2. Explaining assumption which is needed in anacova</td>
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</tbody>
</table>
3. Explaining anacova for randomized design, to covering: linear model, tables of anacova, treatment mean accommodated and comparing test, adequacy checking, follow the example of practice and applying

4. Explaining anacova for randomized block design, to covering: linear model, tables of anacova, treatment mean accommodated and comparing test, adequacy checking, follow the example of practice and applying

5. Explaining anacova for latin square design, to covering: linear model, tables of anacova, treatment mean accommodated and comparing test, adequacy checking, follow the example of practice and applying

6. Explaining anacova for Factorial 2 factor, covering: linear model, tables of anacova, treatment mean accommodated and comparing test, adequacy checking, follow the example of practice and applying

<table>
<thead>
<tr>
<th>CLOSING</th>
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</thead>
<tbody>
<tr>
<td>1. Giving comment to</td>
<td>Answering to,</td>
<td>White board</td>
</tr>
<tr>
<td>work student.</td>
<td>discussion</td>
<td></td>
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<tr>
<td>2. Giving task to be</td>
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<tr>
<td>done at home</td>
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<td></td>
</tr>
<tr>
<td>3. Describing material at next week</td>
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</tbody>
</table>
E. ASSESSMENT: Giving problem to the students.

F. REFERENCES:


LEARNING UNIT PROGRAM

Course Title: Advanced Design of Experiments

Code: PAS 225
Credit: 3
Duration: 3x50 minutes
Week: 6

A. INSTRUCTIONAL AIM

1. General: After studying this course, the student are expected to be able to make analyise in the form of anova, anacova, manova and analysis for repeated measurement design.

2. Specific: The students can analyse for multirespon design

B. SUBJECT: Multivariete Analysis of Variance (Manova)

C. SUB SUBJECT: Manova for:

1. Randomized design
2. Randomized block design
3. General Manova

D. TEACHING-LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>STAGE</th>
<th>LECTURER ACTIVITIES</th>
<th>STUDENT ACTIVITIES</th>
<th>LEARNING MEDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1. Giving opportunity to student to ask previous items which not yet been mastered</td>
<td>Observing and taking notes</td>
<td>OHP, transaparancy White board</td>
</tr>
<tr>
<td></td>
<td>2. Explaining relevance this section with previous section</td>
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<tr>
<td></td>
<td>3. Explaining the material for this section</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>1. Explaining principle of manova</td>
<td>Observing, asking, taking notes, doing task</td>
<td>OHP, transaparancy White board</td>
</tr>
<tr>
<td></td>
<td>2. Explaining manova for the randomized</td>
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</tr>
</tbody>
</table>
|    | design, test and assumption | 3. Exemplifying practice and applying  
4. Explaining manova for the randomized block design, asumsi, and test.  
5. Follow the example of applying and give task  
6. Explaining manova in general |    |
|---|---|---|
| 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**:  
LEARNING UNIT PROGRAM

Course Title : Advanced Design of Experiments
Code : PAS 225
Credit : 3
Duration : 3x50 minutes
Week : 7

A. INSTRUCTIONAL AIM

1. General : After studying this course, the student are expected to be able to make analyse in the form of anova, anacova, manova and analysis for repeated measurement design.

2. Specific : The student can analyse for repeated measurement design

B. SUBJECT : Repeated measurement design
C. SUB SUBJECT : 1. Randomized intime
2. Randomized block intime
3. General repeated measurement

D. TEACHING-LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>STAGE</th>
<th>LECTURER ACTIVITIES</th>
<th>STUDENT ACTIVITIES</th>
<th>LEARNING MEDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>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</td>
<td>Observing and taking notes</td>
<td>OHP, transparancy White board</td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>1. Explaining principle of repeated measurement. 2. Explaining randomized intime, linear model, anova, comparing means and adequacy checking.</td>
<td>Observing, asking, taking notes, doing task</td>
<td>OHP, transparancy White board.</td>
</tr>
</tbody>
</table>

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### E. ASSESSMENT

: Giving problem to the students.

### F. REFERENCES

LEARNING UNIT PROGRAM

Course Title: Advanced Design of Experiments
Code: PAS 225
Credit: 3
Duration: 6x120 minutes
Week: 9, 15

A. INSTRUCTIONAL AIM

1. General: After studying this course, the student are expected to be able to make analyse in the form of anova, anacova, manova and analysis for repeated measurement design.

2. Specific: After following this praktikum 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. Subsampling design
   2. Regression approached
   3. Anacova
   4. Manova
   5. Split block design
   6. Three factor design

D. TEACHING-LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>STAGE</th>
<th>LECTURER ACTIVITIES</th>
<th>STUDENT ACTIVITIES</th>
<th>LEARNING MEDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1. Giving opportunity to student to ask previous items which not yet been mastered</td>
<td>Observing and taking notes</td>
<td>computer</td>
</tr>
<tr>
<td></td>
<td>2. Explaining relevance this section with previous section</td>
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<td></td>
<td>3. Explaining the material for this section</td>
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</tbody>
</table>
| PRESENTATION | 1. Explaining principle of package SAS 6.12 and minitab  
2. Explaining GLM procedure for the: contrast of, anova, anacova, manova, repeated measurement, 3 factor design.  
3. Explaining the way of determining equation of regression.  
4. Explaining the way of determining optimal point.  
5. Explaining output which can be given to done analysis. | Observing, asking, taking notes, doing task | computer |
| CLOSING | 1. Giving comment to work student.  
2. Giving task to be done at home  
3. Describing material at next week | Answering to discussion | computer |

E. ASSESSMENT: Giving problem to the students.

F. REFERENCES:


2. --------------. 1997 Experimental Design for Researchers, Department of Statistics, Faculty of Information and Mathematical Science, Massey University, Australian.

LEARNING UNIT PROGRAM

Course Title: Advanced Design of Experiments
Code: PAS 225
Credit: 3
Duration: 3x50 minutes
Week: 10

A. INSTRUCTIONAL AIM

1. General: After studying this course, the student are expected to be able to make analyse in the form of anova, anacova, manova and analysis for repeated measurement design.

2. Specific: The student can analyse for split block design

B. SUBJECT: Split block design

C. SUB SUBJECT: 1. Introduction

2. Linear model
3. Analysis of variance
4. Comparing means
5. Adequacy checking

D. TEACHING-LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>STAGE</th>
<th>LECTURER ACTIVITIES</th>
<th>STUDENT ACTIVITIES</th>
<th>LEARNING MEDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1. Giving opportunity to student to ask previous items which not yet been mastered</td>
<td>Observing and taking notes</td>
<td>OHP, transparancy White board</td>
</tr>
<tr>
<td></td>
<td>2. Explaining relevance this section with previous section</td>
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<tr>
<td></td>
<td>3. Explaining the material for this section</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>1. Explaining when this design is needed.</td>
<td>Observing, asking, taking notes, doing task</td>
<td>OHP, transparancy White board</td>
</tr>
<tr>
<td></td>
<td>2. Explaining linear model.</td>
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</tbody>
</table>
| 3. Explaining the anova table.  
4. Explaining the way of test to comparing means.  
5. Explaining the way of adequacy checking.  
6. 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:


LEARNING UNIT PROGRAM

Course Title: Advanced Design of Experiments
Code: PAS 225
Credit: 3
Duration: 6x50 minutes
Week: 11, 12

A. INSTRUCTIONAL AIM
   1. General: After studying this course, the student are expected to be able to make analyse in the form of anova, anacova, manova and analysis for repeated measurement design.
   2. Specific: The student can analyse for 3 factor design

B. SUBJECT: Three factor design
C. SUB SUBJECT: Three factor factorial design

D. TEACHING-LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>STAGE</th>
<th>LECTURER ACTIVITIES</th>
<th>STUDENT ACTIVITIES</th>
<th>LEARNING MEDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1. Giving opportunity to student to ask previous items which not yet been mastered</td>
<td>Observing and taking notes</td>
<td>OHP, transparancy White board</td>
</tr>
<tr>
<td></td>
<td>2. Explaining relevance this section with previous section</td>
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<tr>
<td></td>
<td>3. Explaining the material for this section</td>
<td></td>
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</tr>
<tr>
<td>PRESENTATION</td>
<td>1. Explaining about 3 factor design.</td>
<td>Observing, asking, taking notes,</td>
<td>OHP, transparancy White board.</td>
</tr>
<tr>
<td></td>
<td>2. Explaining 3 factor factorial in randomized design covering: linear model, tables</td>
<td>doing task</td>
<td></td>
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<td>of</td>
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<tr>
<td>1. Giving comment to work student.</td>
<td>Answering to, discussion</td>
<td>White board</td>
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<tr>
<td>2. Giving task to be done at home</td>
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</tr>
<tr>
<td>3. Describing material at next week</td>
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</table>

**E. ASSESSMENT:** Giving problem to the students.

**F. REFERENCES:**


LEARNING UNIT PROGRAM

Course Title: Advanced Design of Experiments
Code: PAS 225
Credit: 3
Duration: 6x50 minutes
Week: 13, 14

A. INSTRUCTIONAL AIM

1. General: After studying this course, the student are expected to be able to make analyses in the form of ANOVA, ANACOVA, MANOVA and analysis for repeated measurement design.

2. Specific: The student can analyse for 3 factor design

B. SUBJECT: Three factor design
C. SUB SUBJECT: 1. Split plot design
2. Split plot block design

D. TEACHING-LEARNING ACTIVITIES

<table>
<thead>
<tr>
<th>STAGE</th>
<th>LECTURER ACTIVITIES</th>
<th>STUDENT ACTIVITIES</th>
<th>LEARNING MEDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1. Giving opportunity to student to ask previous items which not yet been mastered</td>
<td>Observing and taking notes</td>
<td>OHP, transparency White board</td>
</tr>
<tr>
<td></td>
<td>2. Explaining relevance this section with previous section</td>
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<td>3. Explaining the material for this section</td>
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</tr>
<tr>
<td>PRESENTATION</td>
<td>1. Explaining split plot design covering: linear model, tables of anova, comparing means, adequacy checking, follow the example of</td>
<td>Observing, asking, taking notes, doing task</td>
<td>OHP, transparency White board.</td>
</tr>
</tbody>
</table>
| CLOSING       | 1. Giving comment to work student.  
|              | 2. Giving task to be done at home  
|              | 3. Giving material for final exam  |
|              | Answering to, discussion           |
|              | White board                        |

E. ASSESSMENT: Giving problem to the students.

F. REFERENCES:
