



**TEACHING INSTRUCTIONAL DESIGN (BRP)**  
**COURSE**  
**RESEARCH METHOD OF MATERIAL**

**by**

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## **PREFACE**

The Teaching Instructional Design (BRP) for the Research Method of Materials course was prepared to be used as a reference for learning the Materials Research Methods course in the Physics Undergraduate Study Program of FMIPA UI, which was attended by physics students who were majoring in material physics in semester 6 on the condition that the student had taken the Modern Physics course. In the Materials Research Methods course, students will be taught to design and start material research activities based on appropriate scientific methods to solve problems faced in everyday life. It is hoped that this BRP can become a reference in the learning process for both lecturers as teachers and students as course participants so that the material is conveyed properly and perfectly.

Depok, November 18<sup>th</sup>, 2016

**Dr. Azwar Manaf, M.Met.**

## I. Informasi Umum

1. Name of Program / Study Level : Physics / Undergraduate
2. Course Name : Research Method of Materials
3. Course Code : SCFI603514
4. Semester : 6
5. Credit : 2 Credits
6. Teaching Method(s) : Interactive Lectures, presentation, active learning, discussion, and written examination.
7. Prerequisite course(s) : Modern Physics
8. Requisite for course(s) : None
9. Integration Between Other Courses : None
10. Lecturer : Dr. Azwar Manaf, M.Met.
11. Course Description : After completing this lecture, physics students with an interest in material physics in semester 6 are able to design (C6) and start (P4) material research activities based on scientific methods in everyday life appropriately to solve (A5) existing problems in accordance with the laws of physics applicable. The language of instruction used in this course is Indonesian.

## **II. Course Learning Outcome (CLO) and Sub-CLOs**

### **A. CLO**

Students are able to design (C6) and start (P4) material research activities based on scientific methods in everyday life to solve (A5) existing problems. (ELO(s) 3, 4, 6, 8)

### **B. Sub-CLOs**

1. Students are able to design (C6) material research activities based on scientific methods in everyday life to solve (A5) existing problems.
2. Students are able to carry out (C3) and start (P4) material research activities based on scientific methods in everyday life to solve (A5) existing problems.

### III. Teaching Plan

| Week | Sub-CLO                    | Study Materials   | Teaching Method                                   | Time Required | Learning Experiences (*O-E-F) | Sub-CLO Weight on Course (%) | Sub-CLO Achievement Indicator                          | References           |
|------|----------------------------|---|---|---------------|-------------------------------|------------------------------|--|----------------------|
| 1    | <b>Course Introduction</b> |   |   |               |                               |                              |  |                      |
| 2    | 1                          | <ul style="list-style-type: none"> <li>Basic principles of research methods</li> </ul>                                      | Interactive lectures, active learning, discussion | 100 minutes   | 20% O, 60% E, 20% F           | 7.14                         | Be able to mention types of research                   | Bibliography related |
| 3    | 1                          | <ul style="list-style-type: none"> <li>Research stages, general research design, precision and accuracy and bias</li> </ul> | Interactive lectures, active learning, discussion | 100 minutes   | 20% O, 60% E, 20% F           | 7.14                         | Be able to tell the research flow                      | Bibliography related |
| 4    | 1                          | <ul style="list-style-type: none"> <li>The sampling method</li> </ul>   | Interactive lectures, active learning, discussion | 100 minutes   | 20% O, 60% E, 20% F           | 7.14                         | Be able to mention ways of taking samples              | Bibliography related |
| 5    | 1                          | <ul style="list-style-type: none"> <li>Statistical techniques and sample types</li> </ul>                                   | Interactive lectures, active learning, discussion | 100 minutes   | 20% O, 60% E, 20% F           | 7.14                         | Be able to explain statistical techniques for research | Bibliography related |
| 6    | 1                          | <ul style="list-style-type: none"> <li>Material testing methods</li> </ul>  | Interactive lectures, active learning, discussion | 100 minutes   | 20% O, 60% E, 20% F           | 7.14                         | Be able to mention material testing methods            | Bibliography related |
| 7    | 1                          | <ul style="list-style-type: none"> <li>Quality control in sampling, sample testing and data processing</li> </ul>           | Interactive lectures, active learning, discussion | 100 minutes   | 20% O, 60% E, 20% F           | 7.14                         | Able to describe sample quality and process data       | Bibliography related |
| 8    | <b>Mid Term Exam</b>       |   |   |               |                               |                              |  |                      |

|    |                        |  |   |             |                     |       |   |                      |
|----|------------------------|--|---|-------------|---------------------|-------|---|----------------------|
| 9  | 2                      | <ul style="list-style-type: none"> <li>Present and communicate research results</li> </ul>                         | Interactive lectures, active learning, discussion | 100 minutes | 20% O, 60% E, 20% F | 7.14  | Able to communicate research results well                   | Bibliography related |
| 10 | 2                      | <ul style="list-style-type: none"> <li>Publish research results</li> </ul>   | Interactive lectures, active learning, discussion | 100 minutes | 20% O, 60% E, 20% F | 7.14  | Be able to explain how to publish research results          | Bibliography related |
| 11 | 2                      | <ul style="list-style-type: none"> <li>Group task</li> </ul>   | Interactive lectures, active learning, discussion | 100 minutes | 20% O, 60% E, 20% F | 7.14  | Able to do group assignments                                | Bibliography related |
| 12 | 2                      | <ul style="list-style-type: none"> <li>Prepare research proposals</li> </ul>                                       | Interactive lectures, active learning, discussion | 100 minutes | 20% O, 60% E, 20% F | 7.14  | Able to write research proposals                            | Bibliography related |
| 13 | 2                      | <ul style="list-style-type: none"> <li>Presentation of group assignments</li> </ul>                                | Presentation                                      | 100 minutes | 20% O, 60% E, 20% F | 7.14  | Able to present tasks that have been done                   | Bibliography related |
| 14 | 2                      | <ul style="list-style-type: none"> <li>UI Grants (PITTA, PIT 9, Achievements)</li> </ul>                           | Interactive lectures, active learning, discussion | 100 minutes | 20% O, 60% E, 20% F | 7.14  | Able to tell the process of getting the UI Grant            | Bibliography related |
| 15 | 1-2                    | <ul style="list-style-type: none"> <li>Closing lecture: Writing a good proposal to win research funding</li> </ul> | Interactive lectures, active learning, discussion | 100 minutes | 20% O, 60% E, 20% F | 14.32 | Be able to describe the details of a good research proposal | Bibliography related |
| 16 | <b>Final Term Exam</b> |  |   |             |                     |       |   |                      |

\*) O : Orientation  
E : Exercise  
F : Feedback

## References:

1. Lecturer personal notes
2. Nicholas Walliman, "Research Methods The Basics", Taylor & Francis e-Library, 2011
3. The 2018 PITTA (Indexed International Publication for UI Student Final Project) Grant,  
DRPM UI
4. Technical Guidelines for Student Final Project Writing UI, 2017
5. Various articles, journals, related references

#### IV. Assignment Design

| Week | Assignment Name | Sub-CLOs | Assignment                  | Scope  | Working Procedure            | Deadline    | Outcome                               |
|------|-----------------|----------|-----------------------------|--|------------------------------|-------------|---------------------------------------|
| 13   | Presentation    | 1-2      | Group presentation creation | <ul style="list-style-type: none"> <li>All materials required</li> </ul>   | Group assignments at home    | 1 week      | Presentation during class             |
| 8    | Mid Term Exam   | 1        | Work on problems            | <ul style="list-style-type: none"> <li>Basic principles of research methods</li> <li>Various types of research activities</li> <li>Designing research activities</li> <li>Guidelines for writing research proposals</li> </ul>   | Do the Mid Term Exam at EMAS | 100 minutes | Answers to questions uploaded on EMAS |
| 16   | Final Term Exam | 2        | Work on problems            | <ul style="list-style-type: none"> <li>Carry out material research activities</li> <li>Processing data from material research</li> <li>Principles of presentation and communication of research results</li> <li>Writing research results in the form of a thesis and publication</li> </ul> | Do the Final Exam at EMAS    | 100 minutes | Answers to questions uploaded on EMAS |

#### V. Assessment Criteria (Learning Outcome Evaluation)

| Evaluation Type | Sub-CLOs | Assessment Type                              | Frequency | Evaluation Weight (%) |
|-----------------|----------|--|-----------|-----------------------|
| Assignment      | 1-2      | 1. Writing<br>2. Presentation<br>3. Research | 1         | 20                    |
| Mid Term Exam   | 1        | Exam questions at EMAS UI                    | 1         | 40                    |
| Final Term Exam | 2        | Exam questions at EMAS UI                    | 1         | 40                    |



|              |            |
|--------------|------------|
| <b>Total</b> | <b>100</b> |
|--------------|------------|

**VI. Rubric(s)**

**A. Criteria of Writing and Presentation Score**

| <b>Criteria</b>  | <b>A (90)</b>  | <b>B (75)</b>  | <b>C (60)</b>   | <b>D (50)</b>  |
|--|--|--|---|--|
| <b>Organization</b><br>(Overall sequences, flows, and transitions) | Information is presented in an effective order. The excellent structure of paragraphs and transitions improves readability and comprehension. The executive summary or abstract is presented first, allowing the reader to easily follow the rest of the report. | Information is logically ordered by paragraphs and transitions. Within a section, the order in which ideas are presented may be confusing at times | Information is scattered and needs further development. | There is no clear sequence of paragraphs, so there is no progressive flow of ideas. The details and examples are disorganized, difficult to follow and understand. |
| <b>Quality of information</b>                                      | Supporting details are specific to the topic and provide the necessary information.  | Some details do not support the topic of the report.   | Details are a bit vague.                                | Unable to find certain details.  |
| <b>Introduction</b>  | The introductory paragraph is clearly stated, has a sharp focus, is different and increases the impact of the report   | The introductory paragraph is clearly stated with focus.   | The introductory paragraph is unclear.                  | The introductory paragraph is unclear.   |

|   |   |   |   |  |
|---|---|---|---|--|
| <b>Conclusion</b>   | Summarize paragraphs summarize and draw clear, effective conclusions and increase the impact of the report.                         | Summarize the following paragraphs and summarize the discussion report and draw conclusions.  | Closing paragraphs are only remotely related to the topic of the report.  | Closing paragraphs are not clear.  |
| <b>Use of language: choice words, grammar, and sentence structure</b> | Sentences are complete and grammatical, and they flow together easily. The word is chosen for its proper meaning.                   | For the most part, sentences are complete and grammatical, and they flow together easily. Every mistake is minor and doesn't distract the reader. Repetition of the same words and phrases is avoided | Minor mistakes in sentence structure and grammar are frequent enough that they detract from the reader and distract from meaning. There are unnecessary repetitions of the same words and phrases | Major mistakes in sentence structure and grammar are frequent enough that they distract the reader and interfere with meaning. There are unnecessary repetitions of the same words and phrases |
| <b>Use of pictures: numbers, graphs &amp; pictures</b>                | All numbers, graphics and images used are accurate, consistent with text, and of good quality. Appropriate and consistent labeling. | For the most part, the numbers, graphics, and images used are accurate, consistent with the text, and of good quality. Some labels are imprecise and consistent.                                      | Few of the numbers, graphics, and images used are accurate, consistent with text, and of good quality. They are not properly labeled.   | Numbers, graphics, and images are of poor quality, have lots of inaccuracies & mislabelling or none at all.  |

**B. Mid Term Exam (UTS) and Final Exam (UAS)**

- 1) Able to express ideas in solving problems (25%)
- 2) Be able to determine the right basic concepts in solving problems (35%)
- 3) Able to formulate the final solution of problems correcting language errors (30%)

4) Able to use the appropriate important units and figures (10%)

**C. Lecture Affective Form**

| <b>Criteria</b>         | <b>5</b>  | <b>4</b>   | <b>3</b>  | <b>2</b>  | <b>1</b>  |
|-------------------------|---|--|---|---|---|
| <b>Communication</b>    | Students provide specific and easy to understand explanations in the discussion and use various tools / methods to facilitate understanding . | Students provide specific explanation and some are easy to understand in discussions and use various tools / methods to facilitate understanding . | Students provide explanations that are less specific and some are difficult to understand in discussions and do not use various tools / methods to facilitate understanding . | Students provide explanations that are not specific and difficult to understand in discussions and do not use various tools / methods to facilitate understanding . | Students provide explanations that are not specific and cannot be understood in the discussion and do not use various tools / methods to facilitate understanding . |
| <b>Class atmosphere</b> | Students use polite language in their interactions, contribute actively, and do not dominate the discussion.                                  | Students use polite language in their interactions, contribute in part, and do not dominate the discussion.  | Students use language that is not polite in their interactions, contributes in part, and dominates the discussion a lot.  | Students use language that is disrespectful in interacting, does not contribute, and dominates discussions.   | Students use language that is disrespectful in interacting, does not contribute, and dominates the discussion.  |
| <b>Openness</b>         | Students provide feedback and value the opinions of others.   | Students give partial feedback and value the opinions of others  | Students do not provide feedback and do not respect other people's opinions   | Students give little feedback and do not respect the opinions of others   | Students do not provide feedback and do not respect other people's opinions.  |
| <b>Behavior</b>         | Students listen very well and behave politely in class.   | Students listen well and behave politely in class.   | Students listen as they are and behave politely in class.   | Students do not pay attention and behave casually in class.   | Students do not listen and behave disrespectfully in class.   |

#### D. Criteria for the Psychomotor Score of Research Work

| <b>Kriteria</b>   | <b>5</b>  | <b>4</b>  | <b>3</b>  | <b>2</b>  | <b>1</b>  |
|-------------------|---|---|---|---|---|
| <b>Work</b>       | Students follow all procedures properly and sequentially  | Students follow most procedures well and sequentially   | Students follow most procedures well but not in order   | Students follow some procedures poorly and out of order   | Students do not follow procedures well  |
| <b>Safety</b>     | Students are careful in doing research and are aware of their surroundings                                    | Students are careful in doing research and are less aware of their surroundings   | Students are not careful in doing research and are less aware of their surroundings.  | Students are a little careful in doing research and are not aware of their surroundings.  | Students are not careful and endanger their surroundings.   |
| <b>Report</b>     | Students write research results in a complete and easy to understand manner                                   | Students write research results incomplete and easy to understand   | Students write research results incompletely and difficult to understand  | Students write some of the research results incomplete and not easy to understand   | Students do not write research results  |
| <b>Activeness</b> | Students are actively working and show interest in research and are diligent in discussing / asking questions | Students are actively working but show less interest in research even though they are diligent in discussing / asking questions | Students are less active in working and show less interest in research even though they are diligent in discussing / asking questions | Students are less active in working and do not show interest in research and are less diligent in discussing / asking questions | Students are not actively working and do not show interest in research and do not discuss / ask questions |