

Module: Research Methods and Senior Project

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| Module Code: Phys-M3121; | EtCTS of Module: 7 ; | Course Status: Compulsory |
| Course Title : | Research Methods and Senior Project | |
| Course Code: | Phys3121 | Credits Hours: 4 |
| Mode of delivery: | Full Semester; | Weeks required: 16 |
| Prerequisite(s): | | Co-requisite(s): |
| Academic Year: | 20_____/____ | Year/Semester: III/ II |
| Students' College/Faculty: | _____ | Department: Physics |
| Program: | Undergraduate | Enrollment: _____ |
| Instructor's Name (Coordinator) | _____ | |
| Address: Email: _____ | Block No. _____; | Rm. No. _____ |
| Class Hours: | _____ | |

Module Rationale

The module is designed to train students of physics to become good researchers by taking a project after introducing them with the basic concepts of research methodology.

Learning Outcomes

Upon completion of this module students will have demonstrated the ability to:

- Formulate research problems and objectives and determine what problem/objective is researchable
- Gain insight into the aspects of literature and studies partially and closely related to the study
- Differentiate the four kinds of research designs and identify the strengths and limitations of each design
- Identify the qualities of a good research instrument
- Diagnose correct statistical tools to answer the research problems/objectives
- Analyze and interpret raw data in terms of quantity, quality, attribute, trait, pattern, trend and relationships
- Follow the widely accepted format and style of writing in the academic community
- Develop the qualities of a good researcher - Research-oriented, Efficient, Scientific, Effective, Active, Resourceful, Creative, Honest, Economical, and Religious
- analyze the content of selected articles in physics or physics related area and critique the arguments made in those articles.
- Perform a literature search; give a scientific presentation, work in the context of a research group, keep a professional log book, present and defend a scientific poster, write a scientific report.
- present their own work using the formats commonly employed in scientific presentations.
- acquire Time-management transferable skill; working in groups; report writing; keeping a professional journal (log book), oral and written presentation, communication.

Module Competency

Up on successful completion of this module students have the ability to:

- Work as a research assistant in science/physics related research centers,
- Develop acceptable research proposal and conduct research in physics and related areas.

Module Description

This module includes nature and characteristic of research, review of literature, designing research, qualities of good research, sampling design, data analysis and interpretation and the styles of research

Module Outline

| No | Topic | Lecture (hrs) | Project (hrs) | Home (hrs) | T.Load (hrs) |
|----|---|---------------|---------------|------------|--------------|
| 1) | Nature and Characteristics of Research | 2 | 6 | 15 | 23 |
| 2) | Research Problems and Objectives | 2 | 6 | 15 | 23 |
| 3) | Review of Related Literature | 1 | 4 | 12 | 17 |
| 4) | Research Design | 1 | 4 | 12 | 17 |
| 5) | Qualities of a Good Research Instrument | 1 | 4 | 12 | 17 |
| 6) | Sampling Designs | 2 | 8 | 15 | 23 |
| 7) | Data Processing and Statistical Treatment | 2 | 6 | 15 | 23 |
| 8) | Data Analysis and Interpretation | 2 | 6 | 15 | 23 |
| 9) | Form and Style in Writing a Research | 2 | 6 | 15 | 23 |
| | Total | 15 | 48 | 126 | 189 |

Note: The Tutorial Column is designed as a time for a face to face interaction between the instructor and the students to discuss the follow-up of senior project work.

Method of Teaching

The module methodology includes lecture that provides condensed explanations, discussion that encourages a flexible exchange of information, and practical work which requires students to practice the techniques they are learning. The focus of the module will be the paradigm shift from instructor-centered to student-centered curricula wherein teaching strategies that promote active learning will be applied such as case studies, cooperative learning, concept tests and problem based learning. Students will introduce to the use of variety of statistical software packages to analyze both quantitative and qualitative data. Students will have independent project work and submit to the module instructor.

Tentative Time Breakdown of Lecture Topics

| Date | Topics | Pedagogical Approaches | Teachers' Tasks/Activities | Students' Tasks/Activities |
|---------------|--|--|--|---|
| Week 1 | NATURE AND CHARACTERISTICS OF RESEARCH <ul style="list-style-type: none"> • Meaning of Research • Qualities and Characteristic of a Good Researcher • Values of Research to Man • Types and Classification of Research • Meaning and Types of Variable • Components of the Research Process | Asking and answering questions Discussion Lecture Demonstration | Introduce module guide book Asking and answering questions Lecturing Form groups for discussion Give home work | Answering and asking questions Taking notes Discuss in group Home exercise |
| Week 2 | RESEARCH PROBLEMS AND OBJECTIVES <ul style="list-style-type: none"> • The Research Problem • The Research Objectives • Statement of Research Problem/Objectives • The Hypothesis and Assumption • Theoretical and Conceptual Framework • Significance of Study • Scope and Limitations of the Study • Definition of Terms | Discussion Lecture | Asking and answering questions Lecturing Give home work | Answering and asking questions Taking notes Group discussion Home exercise |
| Test I | | | | |

| Date | Topics | Pedagogical Approaches | Teachers' Tasks/Activities | Students' Tasks/Activities |
|---|--|--|---|---|
| Week 3 | REVIEW OF RELATED LITERATURE <ul style="list-style-type: none"> • Related Readings • Related Literature • Related Studies • Justification of the Present Study RESEARCH DESIGN <ul style="list-style-type: none"> • Descriptive Design (Types of Descriptive Design) • Experimental Design (Types of Experimental Design) | Discussion Lecture Learning by application | Asking and answering questions Lecturing Lead group discussion Give home work | Answering and asking questions Taking notes Group discussion Home exercise |
| Test II | | | | |
| Week 4 | QUALITIES OF A GOOD RESEARCH INSTRUMENT <ul style="list-style-type: none"> • Validity • Reliability • Usability SAMPLING DESIGNS <ul style="list-style-type: none"> • Advantages of Sampling • Limitations of Sampling • Planning a Sampling Survey • Determination of Sample Size • Scientific Sampling | Discussion Lecture Learning by application | Asking and answering questions Lecturing Lead group discussion Give home work Guide students on how to select a problem | Answering and asking questions Taking notes Group discussion Select researchable problem Home exercise |
| Students search for a researchable project/Problem (by reviewing literature) | | | | |
| Week 5 | DATA PROCESSING AND STATISTICAL TREATMENT <ul style="list-style-type: none"> • Data Processing • Categorization of Data • Coding of Data • Tabulation of Data <ul style="list-style-type: none"> • Data Matrix • Statistical Treatment • Statistical Tools for - Research, Descriptive and Experimental Designs | Discussion Lecture Learning by doing | Asking and answering questions Lecturing Lead group discussion Give comment on students tile Give home work | Answering and asking questions Taking notes Group discussion Incorporate comments on selected topic for project Home exercise prepare for test |
| Students present identified problem through literature review | | | | |
| Test III | | | | |
| Week 6 | DATA ANALYSIS AND INTERPRETATION <ul style="list-style-type: none"> • Univariate, Bivariate, Multivariate Analysis • Normative Analysis • Status Analysis • Descriptive Analysis • Classification Analysis • Evaluative Analysis • Comparative Analysis • Cost-Effective Analysis | Discussion Lecture Learning by doing | Asking and answering questions Lecturing Lead group discussion Give home work | Answering and asking questions Taking notes Group discussion Home exercise |
| Title of student's project approved and literature review continued | | | | |
| Test IV | | | | |

| Date | Topics | Pedagogical Approaches | Teachers' Tasks/Activities | Students' Tasks/Activities |
|------------|---|---|---|--|
| | and colleagues | | | |
| Week 7 | FORM AND STYLE IN WRITING A RESEARCH <ul style="list-style-type: none"> • The Preliminaries of a Research • The Text of a Research Paper • Chapter Headings • Documentation in Research Paper • Notes, Bibliography, References and Literature Cited • Style in Writing | Discussion Lecture Learning by doing Learning by application | Asking and answering questions Lecturing Lead group discussion Give comments on contents of selected title Give home work | Answering and asking questions Taking notes Group discussion Incorporate comments of contents of title Home exercise |
| | Students present contents of selected title and approved and literature review contnued | | | |
| Week 8 | Students finalize their senior project proposal and submit for approval | | | |
| Week 9 | Students present their senior project proposal and get approved | | | |
| Week 10-11 | Students collect data for senior project and write first draft | | | |
| Week 12 | Students present their first draft paper and get commented | | | |
| Week 13 | Students present their first senior project paper and get commented | | | |
| Week 14 | Students submit their final senior project paper | | | |
| Week 15 | Students defend their final senior project paper | | | |
| Week 16 | Written final examination | | | |

N.B. All issues related to students project will be discussed during tutorial sessions schedueld every week.

Students should read the relevant sections in the textbook and/or reference materials and do the assignments on time. Practice with solved problems and come to office hours to get concepts clarified. Review and extra problems will be given through worksheets. Students are also expected to have worked through the problems in the worksheets before the tutorial sessions. Attendance at lectures and tutorials is expected for all students. Attendance records will be taken at all times. It is the students chance to ask questions, solve problems and work in team

Assessment

| No | Type of Assessment | Time | Weight |
|----|---------------------|---------|--------|
| 1 | Test I | Week 2 | 5% |
| | Test II | Week 3 | 5% |
| | Test III | Week 5 | 5% |
| | Test IV | Week 6 | 5% |
| 2 | First presentation | Week 5 | 5% |
| 3 | Second presentation | Week 9 | 10% |
| 4 | Third presentation | Week 13 | 15% |
| 5 | Final presentation | Week 15 | 30% |
| 6 | Final exam | Week 16 | 20% |
| | | Total | 100% |

Recommended References

1. Paler-Calmorin, Laurentina. *Methods of Research and Thesis Writing*, 2006. .
2. Rex Bookstore, Inc. Manila, Philippines Temechegn Engida. *Educational Research Methods (Module)*, 2008.
3. Louis Cohen, Lawrence Manion and Keith Morrison. *Research Methods in Education 5th ed.*, Routledge Falmer, London, 2000.
4. Judith Bell. *Doing Your Research Project (3rd Edition)*. Open University Press, United Kingdom, 1999.

5. Joseph Gibaldi. *MLA Handbook for Writers of Research Paper* 6th ed., First East-West Press Edition, New Delhi, 2004