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College of Science

PHY 1499 Research Project

Guidelines[1]

This guideline document provides a comprehensive framework for the Bachelor's Research Project in Physics. It has been structured according to the National Qualifications Framework (NQF) and EQF Level 6 requirements to ensure the academic rigor and alignment with international standards while fostering the development of fundamental research competencies, practical skills in physics, and ethical research practices. It outlines the Course Objectives, the Course Structure, Assessment Methods, Project Requirements, Final Written Report Guidelines, and the roles of the Supervisor, Examiners, and the Projects Committee, along with the Plagiarism Policy to uphold academic integrity.

1. Course Description

The PHY 1498 research project is a core course in the BSc in Physics program, designed as a capstone module that integrates the knowledge and skills acquired throughout the degree. This course provides students with the opportunity to conduct an independent research project under the supervision of a faculty member. Students will explore a chosen topic within physics or its interdisciplinary applications, developing their ability to formulate research questions, apply problem-solving techniques, and critical thinking. The course also emphasizes the importance of effective scientific communication, requiring students to present their findings through written reports and oral presentations. By engaging in this research experience, students will enhance their analytical skills, deepen their understanding of physics, and prepare for further academic or professional pursuits.

2. Course Profile

Course Title: Research Project
Course Code: PHY 1499
Credit Hours: 4 NQF (5.6 ECTS)
Level: Final Year.
Total Workload: 160 hours (48 contact hours + 112 student workload)
Duration: 12 weeks (1 trimester)
Program: Bachelor of Science in Physics**.**
Pre-requisites: The Research Project course starts in the last trimester of the program study, with 126 Credit Hours associated with the department approval.

[1] Prepared jointly by the Central Unit for Development and Quality and the Department of Physics.

3. Course Objectives

- ✓ Foster students' ability to conduct independent research in physics, applying theoretical and experimental approaches.
- ✓ Enhance technical writing and presentation skills for communicating physics concepts and research findings.
- ✓ Equip students with proficiency in navigating physics literature and employing advanced research methodologies.
- ✓ Promote collaboration, peer review, and ethical practices in physics research

4. Course Structure

✓ **Proposal Submission (by Supervisor)**

- The supervisor submits a research proposal outlining:
  - The research topic and objectives.
  - The expected methodology and approach.
  - Feasibility and scope within the project timeframe.
- The proposal should be reviewed and approved by the "Department Research Projects Committee" before proceeding.

✓ **Work Plan Development**

- The student and supervisor collaboratively develop a structured work plan.
- The plan includes timelines, key milestones, and expected deliverables.

✓ **Literature Review & Data Collection**

- The student conducts a comprehensive review of relevant physics literature, including theoretical frameworks, experimental studies, or computational models.
- Data collection begins, which may involve experimental measurements, computational simulations, or theoretical calculations, as applicable.

✓ **Problem Analysis & Results**

- The student engages in problem formulation, theoretical analysis, experimental data analysis, or computational modeling.
- Regular discussions with the supervisor refine methodologies and interpret results, ensuring alignment with research objectives.

✓ **Report Drafting**

- The student drafts a research report adhering to academic and physics-specific guidelines
- The supervisor provides iterative feedback to enhance clarity, rigor, and scientific accuracy.

✓ **Presentation & Defense**

- The student delivers a formal presentation of their findings to the supervisor and a panel of evaluators.
- The panel assesses the clarity, scientific depth, originality, and relevance of the research to the field of physics.

✓ **Supervisory Meetings**

- Weekly meetings between the student and supervisor ensure consistent progress, address challenges, and maintain focus on research goals.

5. Workload Allocation

Component	Contact Hours	Student Workload	Total Hours
Work Plan and Methodology Development	4	10	14
Literature Review and Data Collection	12	24	36
Problem Analysis and Results	16	40	56
Report Drafting	8	20	28
Presentation and Defense	8	18	26
Total	**48**	**112**	**160**

6. Trimester Timeline and Milestones

The following timeline outlines critical milestones for physics research projects to help students manage their workload effectively during a 12-week trimester: effectively:

Project Phase	Period
Proposal Submission by Supervisors	**The previous trimester**
Announcement of selected projects and Projects allocation	**Week 1**
Work Plan and Methodology Development	**Week 2**
Literature Review and Data Collection Completion	**Weeks 3-4**
Problem Analysis and Results	**Weeks 5-8**
Report Writing	**Weeks 9-10**
Final Review and Editing	**Week 11**
Project Submission and Presentation/Defense	**Week 12**

7. Research Project Assessment

Assessment Component	Who Will Assess	What Will Be Assessed	How It Will Be Assessed	CLOs Assessed	Weight
Midterm Project Progress Review	Supervisor	Progress on project objectives, data collection, methodology implementation.	One-on-one meetings to present progress and issues encountered.	1.1,1.2, 1.3, 2.4, 2.1, 2.2	25%
Draft Report Submission	Supervisor	Quality and depth of the literature review, methodology.	Submission of a draft report for feedback.	1.1, 1.3	25%
Final Report	Supervisor	Overall research, analysis, data interpretation, and report structure.	Full research report submission for grading.	1.3, 2.2, 2.3,2.4	20%
Final Presentation	Examiners	Clarity and effectiveness in presenting research, engagement with the audience, ability to defend findings.	Oral presentation with Q&A session.	2.2, 2.3	30%
Ethical Considerations & Reflection	Supervisor	Understanding and application of research ethics and societal impact.	Written reflection integrated into the final report and discussed during the presentation.	3.1, 3.2	Included in Report & Presentation

8. Reference Rubric for Evaluation of bachelor's Research Project (EQF Level 6)

Criteria	Aligned CLO(s)	Excellent (90-100%)	Good (80%-89%)	Satisfactory (70%-79%)	Needs Improvement (60%-69%)	Unacceptable (<60%)
Research problem	1.1, 1.3	Clear, innovative, well-defined, and highly relevant to physics.	Clear and relevant to the field but lacks some originality.	The research question is clear but lacks focus or relevance.	Vague or poorly defined, with limited relevance to physics.	No clear research question or highly irrelevant.
Research Methodology	2.1, 2.2, 2.4	Sophisticated, well-justified methodology appropriate for the problem.	Appropriate methodology, with some justification.	Methodology is acceptable but lacks detailed justification or clarity.	Methodology is vague or poorly aligned with the problem.	Inappropriate methodology or not described.
Analysis and Results	1.2, 1.3, 2.4	Accurate analysis with insightful results.	Accurate analysis with clear results but lacking depth or interpretation.	Acceptable analysis, but results are only partially interpreted or insufficient.	Incomplete or inaccurate analysis, with weak or unclear results.	No analysis or results presented.

Theoretical and experimental Understanding	1.1, 1.3, 2.1, 2.2	Demonstrates a deep understanding of relevant theories, experiments, and models, and applies them effectively.	Good understanding of theories, experiments, and models, and application, with minor gaps.	Adequate understanding of relevant theories and experiments but not fully applied.	Limited understanding of relevant theories and experiments or improper application.	No understanding of relevant theories and experiments or models.
Writing Quality	2.3	Well-organized, clear, and coherent writing with no grammatical errors.	Clear and well-organized with minor grammatical errors.	Some unclear or disorganized sections with some grammatical errors.	Poorly written, with many unclear sections and frequent grammatical errors.	Extremely poor writing, lacking clarity and coherence.
Structure and Organization	1.3, 2.2	Logical and well-structured report with seamless flow between sections.	Well-structured, but minor issues in the flow between sections.	Adequately structured, but transitions and organization could be improved.	Disorganized with unclear transitions and poor structure.	No clear structure or organization.
Presentation	2.2, 2.3	Highly professional, confident, and clear in presenting research findings.	Clear and professional, but with some minor issues in presentation style.	Adequate presentation but lacks confidence or clarity.	Disorganized presentation with unclear communication.	Incoherent or unprofessional presentation.
Ethical Considerations	3.1, 3.2	Comprehensive understanding and application of ethical principles in research.	Good understanding of ethical considerations with minor lapses.	Basic understanding of ethics but lacks deep reflection.	Limited ethical reflection or improper application.	No ethical reflection or significant ethical issues.
Literature Review	1.1, 1.3	Thorough and well-organized review of relevant literature.	Good literature review but may miss some relevant sources or critical analysis.	Adequate review but limited in scope or depth.	Incomplete or poorly conducted review of literature.	No meaningful literature review.

9. Project Submission Process

•The Department Research Projects Committee requests faculty members of the department, in both male and female branches, to submit their research project proposals for the upcoming trimester. These proposals must be submitted at least one month before the end of the current semester using the designated form (Form-1).

•The research project proposal form (Form-1) should indicate whether the project is designed for a single student or a pair of students.

•After reviewing the proposed research topics and eliminating any unsuitable ones, the Department Research Projects Committee announces the approved projects on the college's website at the beginning of each semester.

•Every student enrolled in the research project course must submit their preferred topics from the proposed projects using the designated form (Form-2) to the departmental Research Projects Committee within three days of the project announcement.

•The Department Research Projects Committee reviews the submitted forms, verifies that the student meets the required conditions, and assigns approved projects to students while considering their preferences. Priority is given based on students' academic performance. Once the assignments are finalized, both students and their supervising faculty members are notified.

•The Department Research Projects Committee completes the assignment of students to projects by the end of the first week of the trimester.

•A faculty member may supervise a maximum of two students and two research projects.

•The department may, when necessary, seek the assistance of faculty members from outside the department, provided they possess the required academic competence and practical experience.

10. Research Project Requirements

To successfully complete the **PHY 1498 Research Project**, students must adhere to the following guidelines:

Scope of the Project

- The project must address a well-defined, significant problem in physics (e.g., theoretical, experimental, or computational physics).
- It should demonstrate **creativity, critical thinking, and a strong foundation** in physics principles.
- The research should provide meaningful insights, whether through theoretical advancements, experimental findings, or computational simulations, with potential applications in physics or related fields.

Originality & Academic Integrity

- The project must be the student's **original work**, showcasing independent research and problem-solving in physics.
- All findings should be supported by **relevant academic literature**, properly cited.
- Plagiarism, data manipulation, or any form of academic dishonesty will result in disciplinary action.

Supervision & Progress Monitoring

- Students must maintain **regular communication** with their supervisor through scheduled meetings (e.g., weekly, as outlined in the course structure).
- Scheduled **progress updates and draft submissions** must be completed as agreed upon.
- Failure to meet deadlines or submit substantive updates may negatively impact the project evaluation.

Submission & Deadlines

- Students must strictly adhere to all submission deadlines, including:
  - Research Proposal.
  - Midterm Progress Report.
  - Final Written Report.
  - Oral Presentation & Defense.
- Late submissions will incur penalties unless prior approval is obtained from the supervisor due to valid reasons.

11. Final Written Report Requirements

The final written report is the cornerstone of the PHY1498 Research Project and represents the completed research project. It is the primary document used by the academic supervisor and the Examiners Committee to evaluate the project. This report must be comprehensive, well-organized, and free of errors, as it reflects the quality of the student's work and effort. It must adhere to academic standards to ensure clarity, professionalism, and proper documentation.

By meeting the following requirements, students will produce a high-quality research report that effectively communicates their findings:

Structure

The report must include the following sections:

- **Title Page**: Includes the project title, student's name, student ID, supervisor's name, and submission date.
- **Abstract**: A 200–300-word summary of the project, highlighting the physics research problem, methodology, results, and conclusions.
- **Table of Contents**: Clear and properly formatted, with page numbers for all sections.
- **Introduction**: Provides background, defines the research problem, and outlines objectives and significance.
- **Literature Review**: A review of relevant academic work to contextualize the research problem, including theoretical frameworks, experimental studies, or computational models.
- **Methodology**: Details the methods used, such as experimental setups, theoretical derivations, computational simulations, or software tools employed.
- **Results and Discussion**: Presents findings with thorough analysis, supported by figures, tables, graphs, or equations as appropriate.
- **Conclusion and Recommendations**: Summary of findings and their implications.

- **References**: A complete and properly formatted reference list using the department-approved citation style.

Formatting:

- Font: Times New Roman, 12 pt.
- Spacing: 1.5-line spacing.
- Margins: 1 inch (2.54 cm) on all sides.
- Length: 20-30 pages (excluding appendices and references).

Technical Requirements:

- Figures, tables, and equations must be properly labeled and numbered.
- Mathematical symbols and notations should conform to standard conventions.
- Appendices may include supplementary data, code, or additional figures if needed.

Language and Style:

The report should be written in clear, formal, and precise academic English.

Modes of References and Citations:

Proper referencing and citation are critical for academic integrity in the PHY1498 Research Project. Students must adhere to the following citation styles:

Book

Format: [Number] Author, Title of Book, xth ed. City of Publisher, (only U.S. State), Country: Publisher, Year.
Example:
[1] R. Feynman, The Feynman Lectures on Physics, Vol. 1, 2nd ed. Reading, MA, USA: Addison-Wesley, 1963

Journal Article

Format: [Number] Author, "Title of Article," Title of Journal, vol. x, no. y, pp. xx-xx, Month, Year.
Example:
[2] J. Bell, "On the Einstein Podolsky Rosen paradox," Physics, vol. 1, no. 3, pp. 195-200, Nov. 1964.

Website

Format: [Number] Author, "Title of Webpage," *Website Name*. [Online]. Available: URL. [Accessed: Month Day, Year].
Example:
[3] P. Dirac, "Quantum Mechanics Basics," *Physics Online*. [Online]. Available: https://www.physicsonline.org/quantum. [Accessed: March 1, 2025].

12. Research Project Defense

The defense of the research project is the final stage of the process, where the student's work is evaluated by the Examiners committee. The approval of research projects for defense by the Department Research Projects Committee is based on the supervisor's reports. Then the Department Research Projects Committee schedule the oral defenses, forms a defense committee for each qualified project, and provide them with a copy of the Project Reports and Assessment Forms.

Discussion Duration

The discussion lasts for approximately **30 Minutes**, divided as follows:

- **20 Minutes**: Student presents their research project.
- **10 Minutes**: Examiners ask questions and discuss the project.

Discussion Evaluation Criteria

- Content quality report: 15 marks.
- Oral presentation and answering questions: 15 marks.

13. Roles and Responsibilities

13.1. Responsibilities of the Supervisor

Supervisors are essential to guiding students through the research process and ensuring their academic and professional growth. They provide mentorship, expertise, and support, helping students meet academic standards and achieve success in their research projects.

Responsibility	description
Proposal Submission	Submit a well-defined research proposal that outlines the research problem, objectives, methodology, and expected outcomes.
Work Plan Development	Assist the student in creating a structured timeline with achievable milestones and deadlines.
Literature Review Support	Provide direction on relevant research papers, textbooks, and theoretical or experimental references specific to the research area.
Research Methodology Guidance	Advise on appropriate physics methodologies, such as analytical techniques, experimental setups, or computational tools.
Regular Meetings & Progress Monitoring	Conduct weekly meetings to track progress, address challenges, and provide timely feedback.
Critical Review of Drafts	Review drafts of the research report, ensuring clarity, logical structure, and accurate interpretation of results, with constructive feedback for improvement.
Encouraging Independent Thinking	Support students in developing problem-solving skills without directly providing solutions.
Ethical Research Oversight	Ensure students adhere to ethical research practices, including proper citations and academic integrity.
Preparation for Presentation & Defense	Help students refine their presentation skills and anticipate possible questions from evaluators.
Final Evaluation & Feedback	Assess the student’s overall research performance and provide input for grading.

13.2. Responsibilities of Examiners

The Department Research Projects Committee forms a defense committee for each Research project, consisting of the supervisor, a representative from the committee, and a third faculty member from the academic department specializing in the project's field. Examiners play a crucial role in upholding academic rigor, integrity, and research quality. Their responsibilities ensure that students meet high academic standards, demonstrate strong research skills, and are well-prepared for future academic or professional pursuits.

Responsibility	Description
Assessment of Overall Academic Quality	Evaluate the overall research quality, including clarity, coherence, methodology, depth of analysis, and significance of findings.
Assessment of Research Skills	Assess the student's ability to conduct independent research, apply appropriate techniques, and demonstrate problem-solving in addressing physics-specific challenges.
Objectivity and Fairness	Ensure evaluations are unbiased, transparent, and based on well-defined assessment criteria.
Review of Written Report	Examine the structure, clarity, technical accuracy, depth of discussion, and appropriate use of references in the research report.
Evaluation of Presentation	Assess the student's ability to effectively communicate their research, defend their findings, and respond to questions during the oral Presentation**.**
Assessment of Ethical Considerations	Ensure that the student adheres to ethical research practices, including proper citations, responsible data handling, and academic honesty.
Feedback and Recommendations	Provide constructive feedback on strengths and areas for improvement, suggesting further research directions if applicable.
Decision on Awarding the Grade	Make a final decision regarding whether the student meets the Research project requirements.
Mentoring Role (Optional)	Offer guidance and mentorship to enhance the student's research skills, critical thinking, and academic growth.

13.3. Responsibilities of the Department Research Projects Committee

The plays a vital role in overseeing the organization, quality control, and evaluation of research projects. Its responsibilities encompass various stages of the project, from selection and supervision to evaluation and quality assurance. The committee ensures that projects meet academic standards, guides students throughout their research, and supports faculty in maintaining the integrity and quality of the research process.

Responsibility	Description
Planning and Coordination	- Establish guidelines for project objectives, scope, and deadlines. - Approve project proposals, ensuring they are relevant, feasible, and of appropriate academic rigor. - Allocate supervisors based on expertise and research topics. - Schedule project milestones (e.g., proposals, progress reports, final submission).
Supervision and Monitoring	- Monitor student and supervisor progress regularly. - Organize meetings to address challenges and provide guidance. - Resolve conflicts between students and supervisors.
Quality Assurance	- Ensure projects meet academic and professional standards. - Oversee review of proposals, interim reports, and final submissions. - Ensure compliance with ethical guidelines (e.g., plagiarism policies).
Evaluation and Feedback	- Form committees for fair and consistent project evaluations. - Coordinate feedback to help students improve their work. - Assess whether projects align with program learning outcomes.
Administrative Duties	- Manage documentation of project progress and outcomes. - Report updates to department heads or academic boards. - Allocate necessary resources (e.g., lab space, equipment, funding).
Support and Development	- Assist students in selecting relevant and feasible topics. - Organizes workshops on research methodology, data analysis, and academic writing. - Promote interdisciplinary research opportunities.
Final Presentation	- Approval of Research Projects for Defense. - Proposal for Examiner Committees. - Scheduling the oral defenses. - Provide the Examiner Committees with a copy of the Project Reports. - Provide the Examiners Committee with Assessment Forms.
Post-Completion Activities	- Ensure consistency and fairness in grading - Archive completed research projects for reference. - Review the process for continuous improvement. - Gather feedback from students and supervisors.

14. Plagiarism Policy

The Plagiarism Policy forms a vital part of the ethical framework governing the MAT1499 Research Project, ensuring the integrity of both individual research and the broader academic community. Adherence to these standards reflects a student's commitment to responsible and honest scholarly work. Plagiarism is prohibited and will result in serious academic consequences, as any instance of copying or presenting another person's work as one's own constitutes a violation of academic integrity.

14.1. Definition of Plagiarism:

Plagiarism is defined as the act of using another person's intellectual property—including text, data, images, ideas, code, or creative work—without proper acknowledgment or permission, thereby misrepresenting it as one's own original work.

Examples include:

- Copying text without quotation marks or citation.
- Paraphrasing without attribution.
- Using data, charts, or images without credit.
- Submitting work prepared by someone else (ghostwriting).
- Reusing one's own previously submitted work without disclosure (self-plagiarism).

14.2. Academic Integrity and Plagiarism

All students are expected to uphold the highest standards of academic honesty in all submitted work. Plagiarism—the act of presenting someone else's words, ideas, or research as your own without proper acknowledgment—is strictly prohibited and constitutes a serious violation of academic integrity. The University uses plagiarism detection software to identify overlapping content with existing sources; however, the similarity score generated is only an indicator of potential issues and does not, by itself, determine whether plagiarism has occurred. Each case is assessed based on academic judgment, context, and proper use of citations. Students are responsible for ensuring that their work is original and that all sources are correctly cited in accordance with academic standards. Violations may result in disciplinary action. This distinction ensures that students are evaluated fairly and that innocent overlaps due to legitimate academic writing are not mistaken for misconduct.

14.3. Application to Student Research Projects

Student research projects are considered key components of academic assessment and require special attention regarding academic integrity.

❖ Declaration of Original Work

All students submitting research-based coursework must complete and sign a Declaration of Authorship, confirming that:

- The submitted work is their own.
- All sources have been properly cited.
- No part of the work has been previously submitted without prior approval.

This declaration is uploaded along with the submission via the university's digital platform.

❖ Use of Plagiarism Detection Tools

To ensure academic integrity and uphold the standards of scholarly work, both the supervisor and the course instructor use the **Blackboard SafeAssign** tool available within the Learning Management System (LMS). This tool assists in detecting similarities between student submissions and existing sources, helping to prevent plagiarism. Students are encouraged to

review their work carefully, cite all sources properly, and make use of the available resources to submit original work. Any detected violations of academic integrity will be addressed in accordance with the university's regulations and policies.

14.4. Possible Sanctions

Sanctions vary depending on severity and intent:

LEVEL	ACTION
Minor (unintentional)	Resubmission with penalty; mandatory workshop attendance
Moderate	Fail grade for the assignment/course
Severe (deliberate fraud)	Failing the course, suspension, or expulsion

Acknowledgment of Sources

All external sources, including literature, data, and software tools, must be properly cited using the referencing style specified by the department. Proper citation ensures that intellectual property rights are respected and allows others to verify the sources you have consulted. Failure to cite sources accurately and consistently will be considered an academic violation. Students are encouraged to use reference management tools to track their sources and ensure proper citation throughout the research process.