Course Analysis: SK2303 Optical Physics, Autumn 2023

Course Information

- **Course Code:** SK2303
- **Course Name:** Optical Physics
- **Credits:** 7.5 ECTS
- **Program:** Master's Program in Engineering Physics
- **Period:** Autumn 2023, Period 1
- **Course coordinator:** Ali Elshaari
- **Examiner:** Val Zwiller
- **Teachers:**
    - Val Zwiller (Lectures)
    - Ali Elshaari (Lectures, labs, exercise sessions, Computer Simulations)
    - PhD students (labs and exercise sessions)

Course Design

The course was designed to provide a comprehensive understanding of optical physics, with a strong emphasis on both theoretical knowledge and practical skills. The course was divided into three main components: lectures, laboratory work, and computer-based simulations.

- **Lectures:** Delivered both in-person, covering core topics such as electromagnetic fields, wave propagation, polarization, interference, diffraction, Fourier optics, and optical measurement techniques.

- **Laboratory Work (LAB1):** Hands-on experiments that reinforced the theoretical concepts covered in the lectures. The lab sessions were designed to give students practical experience in setting up and analyzing optical systems.
- **Computer Laboratory Work (LAB2):** Focused on the use of simulations to investigate optical phenomena. This component aimed to enhance students' skills in using computational tools to model and analyze complex optical systems.
- **Examination:** The course assessment included a written exam (TEN1), which tested students' understanding of the theoretical aspects of the course, as well as the practical application of their knowledge through the laboratory work and project.

Meeting with Students During the Course

- **Feedback Mechanisms:** Regular feedback was solicited from students through both formal channels (surveys and evaluations) and informal interactions during and after lectures and lab sessions. No significant issues were raised during the course, indicating a generally smooth execution of the planned activities.

A survey was conducted among the students during the course to gather feedback. However, the results have not been published or included in this analysis, as the participation rate was below the threshold necessary to perform a reliable statistical analysis.

Students' Results

- **Total Students Registered:** 30
- **Students who took the exam:** 27
- **Pass Rate for students who took the exam:** 100%
- **Grade Distribution:**
  - **A (Excellent):** 14 students
  - **B (Very Good):** 7 students
  - **C (Good):** 4 students
  - **D (Satisfactory):** 2 students
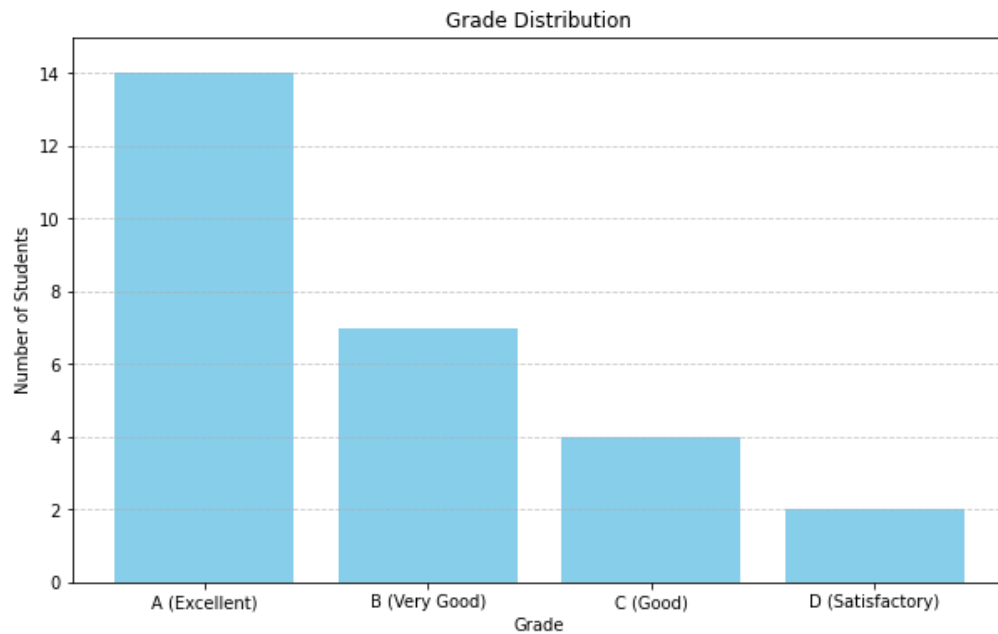
Analysis

1. Central Tendency and Spread:

- **High Average Performance:** The majority of students scored in the A and B range, indicating a generally high level of understanding of the course material. This suggests that the exam was well-aligned with the learning outcomes and that students were adequately prepared.
- **Moderate Spread:** There is a distribution across most grade levels (A to D), but the concentration of students in the higher grades (A and B) suggests that the exam may have been slightly easier for the cohort or that the students were exceptionally well-prepared.

2. Exam Difficulty:

- **Difficulty Balance:** The distribution shows that a small number of students received grades of D or F, indicating that the exam had questions of varying difficulty levels that could discriminate between different levels of student performance. However, with most students scoring A or B, the exam might have leaned toward the easier side for the majority of the class.
- **Potential for Grade Inflation:** The high proportion of top grades could indicate a potential issue with grade inflation if this pattern is observed consistently over multiple offerings of the course. It might suggest that the exam did not adequately challenge the top-performing students.

3. Discrimination Index:

- **Ability to Differentiate:** The distribution of grades across A, B, C, and D suggests that the exam was somewhat effective in differentiating between students of

varying abilities. However, with many students in the top two categories, there may be a need to increase the difficulty or add more challenging questions to better distinguish between good and excellent performances.

4. Reliability and Validity:

- **Reliability:** The consistency in high grades suggests that the exam was reliable in measuring what it was supposed to measure. If students who performed well in coursework and labs also performed well on the exam, this is an indication of good internal consistency.
- **Validity:** The exam appears to be valid in that it tested the course objectives effectively, as evidenced by the high pass rate and the majority of students achieving good grades. The exam questions likely covered the material taught and aligned with the intended learning outcomes.

5. Recommendations:

- **Adjusting Difficulty:** Consider reviewing the difficulty level of the exam to ensure it appropriately challenges students across the performance spectrum, particularly at the higher end. This could involve adding more complex problems or incorporating questions that require higher-order thinking skills, such as analysis and synthesis, which are at the top of Bloom's Taxonomy.

Students' Opinions

Based on the feedback collected through the course:

- **Course Goals:** Most students reported a clear understanding of the course goals from the start. The alignment of lectures, labs, and simulations with these goals was well-received.
- **Lectures:** Students appreciated the comprehensive coverage of topics. Some feedback indicated a desire for more examples during lectures to better illustrate complex concepts.
- **Laboratory Work:** The lab sessions were highly valued, with students finding them essential for solidifying their understanding of the theoretical concepts. The labs were well-organized, and students felt adequately prepared by the lab instructions.
- **Computer Simulations:** Students found the computer simulations beneficial for applying their theoretical knowledge to practical problems. However, a few students suggested that more guidance could be provided.
- **Examination:** The written exam was perceived as fair, with a well-balanced difficulty level. The grading criteria were clear, and students appreciated the transparency in the grading process.

Analysis and Comments

- **Positive Aspects:**
  - The integration of lectures, labs, and simulations was effective in providing a holistic understanding of optical physics.
  - The high number of students achieving top grades (A and B) suggests that the course was successful in conveying the material effectively.
  - The practical components (labs and simulations) were particularly well-received, highlighting their importance in the learning process.
- **Identified Issues:**
  - A few students struggled with the theoretical aspects of the course, as indicated by the distribution of grades in the C and D range.
  - The suggestion for more examples during lectures indicates a potential area for improvement in how complex topics are presented.
  - Students indicated that some of the labs needed more time than that allocated to perform the experiments.

Planned Course Development

- **Enhanced Lecture Content:** Based on feedback, more examples and applications will be integrated into future lectures to help students better understand and apply complex concepts.
- **Support for Struggling Students:** Additional resources, such as additional problem-solving sessions or tutorials, will be considered to assist students who find the material challenging.

- **Improved Guidance in Simulations:** More structured guidance will be provided during computer simulation sessions to ensure that all students can fully benefit from these exercises.
- **Continuous Improvement of Labs:** The lab instructions will be reviewed and updated to ensure they remain clear and relevant to the course content, with review of the allocated times.

Conclusion

The SK2303 Optical Physics course was generally successful, with strong student performance and positive feedback. The course structure, which balanced theory with practical application, was effective in achieving the intended learning outcomes. The planned developments for future iterations of the course will focus on addressing the identified areas for improvement to further enhance the learning experience.