REVIEW

For Syllabus of "PHY 3052-Synthesis and Physical Properties of Low-Dimensional Structures"

Lecturer: PhD, Associated Professor Baitimbetova Bagila

Educational program 8D05301 – "Applied and Engineering Physics"

This syllabus contains all the essential elements that enable students to acquire fundamental and practical knowledge within the framework of the course Synthesis and Physical Properties of Low-Dimensional Structures.

The program includes clearly formulated course goals and objectives, a description of the discipline, as well as clear and measurable learning outcomes.

The calendar and thematic plan is logically and consistently structured: it includes a complete list of lectures and practical classes for one semester (15 weeks), a list of required literature, assignments, and deadlines.

It should be noted that the presentation of the material follows modern pedagogical design principles, and the structure fully corresponds to the requirements of the educational program 8D05301 "Applied and Engineering Physics."

The thematic content reflects current trends in materials science and nanotechnology, including the synthesis of nanostructures, analysis of their physical properties, and interdisciplinary approaches to studying low-dimensional systems.

The practical orientation of the course deserves particular attention: laboratory work is fully aligned with lecture topics and allows students not only to strengthen theoretical knowledge but also to develop professional skills in the experimental study of low-dimensional structures.

The included practical assignments contribute to the development of analytical thinking, data processing skills, critical evaluation of results, and preparation for future research activities.

The syllabus also contains a strong research component: the course content supports the development of students' independent research skills, the use of modern analytical tools, and can serve as a basis for parts of dissertation research.

The list of literature is selected appropriately and includes modern textbooks, monographs, and scientific articles, ensuring high-quality theoretical preparation. The inclusion of English-language sources supports the development of academic English skills.

In addition, the syllabus clearly and transparently describes the rating system, assessment criteria, and policies on academic discipline and ethics, ensuring students have a clear understanding of course expectations and promoting a fair educational environment.

Overall, the syllabus is developed at a highly professional level, reflects modern requirements for teaching nanotechnology- and materials science-related disciplines, and contributes to the training of highly qualified specialists in applied and engineering physics.

Reviewer:

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The course content is relevant and aligned with current developments in nanotechnology and low-dimensional materials research. The integration of laboratory work with lecture topics is a excellent feature, ensuring that students develop meaningful experimental skills.

However, several improvements are required to enhance the clarity of the syllabus. The learning outcomes, although present, remain too broad for a doctoral-level course. Statements such as "students will understand synthesis methods of nanostructures" do not reflect advanced competencies. They should be rewritten in measurable terms, for example: "Students will be able to synthesize nanorods via hydrothermal growth and characterize their structure using SEM and XRD." Such specificity is essential for proper assessment.

To further strengthen clarity, the syllabus should explicitly outline Course Learning Outcomes (CLOs) and map them to the program's Program Learning Outcomes (PLOs). For example, a CLO on synthesis nanostructures can map to a PLO on advanced experimental technique, while a CLO on sample characterization can map to analytical and instrumentation skills. This alignment helps ensure that the course contributes directly to the intended doctoral-level competencies.

The syllabus should also provide clearer detail on the actual synthesis and characterization methods taught. Broad terms like "study of physical properties" do not indicate whether students will work with CVD, PLD, sol–gel synthesis, Raman spectroscopy, AFM, or UV–Vis analysis. Listing these techniques enhances transparency and aligns the course with international standards in materials science education.

Assessment criteria are included but remain general. More transparent rubrics such as allocating percentages for presentation, report on the methodology, data interpretation, figure quality, and discussion would make grading fair and consistent. The course should also more clearly support dissertation preparation by encouraging students to align laboratory work or mini-projects with potential research topics.

In summary, the syllabus is fundamentally strong but requires clearer and measurable learning outcomes, explicit CLO–PLO mapping, more detailed methodological descriptions and clear rubrics fraction to meet doctoral-level expectations in applied and engineering physics.

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