Physics Independent Study Course Approval Form

Student Name Harry Luo Campus ID 9084866434 Semester Requested 1
Instructor of Record (must be Physics Faculty) Matt Otten
Active Supervisor (if different from above) _____ Department _____

Brief description of course content and proposed work:
As an extension to my summer research, I will investigate the performance of the GKP code under pure loss channel. Building on analytical framework of Zheng et. al., we explore the theoretical fidelity limits and practical performance of fundamental logical gate operations (X, Z, H) applied to a GKP-encoded qubit.

It consists of two parts:
1. a simulation framework to quantify the performance of GKP logical gates with near-optimal recovery protocols.
2. if possible, deriving the theoretical fidelity limits for these operations, directly generalizing the methods of Zheng et al.

Proposed course number (check one):

Elementary level: no prior physics background required.
☐ Physics 198: 1-3 credits (graded satisfactory/unsatisfactory) ☐ Physics 199: 1-3 credits (graded A-F)

Intermediate level: working at level requiring material in physics 207/208/241 courses.
☐ Physics 298: 1-3 credits (graded satisfactory/unsatisfactory) ☐ Physics 299: 1-3 credits (graded A-F)

Advanced level: work at level of physics 311 or 322 or above.
☐ Physics 498: 1-3 credits (graded satisfactory/unsatisfactory) ☐ Physics 499: 1-3 credits (graded A-F)

Senior Thesis
☒ Physics 681 Honors: 3 credits (graded P) ☐ Physics 682 Honors: 3 credits (graded A-F)
☐ Physics 691: 2-3 credits (graded P) ☐ Physics 692: 2-3 credits (graded A-F)

Planned average hours/week of work 10 for 14 weeks.
Proposed number of credits (1,2, or 3) 3
Note: minimum of 45 hours work is expected for each credit.

Number of meetings planned with supervisor 14.

At the end of the semester, you are expected to complete a written summary report of the work completed during the semester. This report need not be lengthy, but should be indicative of what was actually accomplished. ***Note that this is a required element and a copy must be turned in to the department office before the grade is filed.***

Signed Harry Luo _____ date 9.1
(Student)

_____ date 09/03/2025
(Instructor of record)

_____ date _____
(Active supervisor if applicable)

Approved: _____ date _____
(Physics advisor)

Return the signed form to Physics advisor, Evan Heintz (2320D Chamberlin Hall, eheintz@wisc.edu, 608-263-7450), who will then approve it and give you permission to enroll.