

# PHYS 224: ADVANCED STATISTICAL MECHANICS

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## In Workflow

1. PHYS Committee Chair (mikkel.jensen@csus.edu)
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9. Catalog Editor (catalog@csus.edu)
10. Registrar's Office (k.mcfarland@csus.edu)
11. PeopleSoft (PeopleSoft@csus.edu)

## Approval Path

1. Fri, 13 Sep 2024 19:59:31 GMT  
Mikkel Jensen (mikkel.jensen): Approved for PHYS Committee Chair
2. Fri, 13 Sep 2024 19:59:59 GMT  
William DeGraffenreid (degraff): Approved for PHYS Chair
3. Wed, 02 Oct 2024 22:44:01 GMT  
Mikkel Jensen (mikkel.jensen): Approved for NSM College Committee Chair
4. Fri, 11 Oct 2024 18:35:37 GMT  
Chris Taylor (ctaylor): Approved for NSM Dean

## New Course Proposal

Date Submitted: Wed, 11 Sep 2024 16:25:13 GMT

**Viewing: PHYS 224 : Advanced Statistical Mechanics**

**Last edit: Wed, 02 Oct 2024 22:42:57 GMT**

Changes proposed by: Rodolfo Barniol Duran (219696192)

### Contact(s):

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### Catalog Title:

Advanced Statistical Mechanics

### Class Schedule Title:

Advanced Statistical Mechanics

### Academic Group: (College)

NSM - Natural Sciences & Mathematics

### Academic Organization: (Department)

Physics and Astronomy

### Will this course be offered through the College of Continuing Education (CCE)?

No

### Catalog Year Effective:

Fall 2025 (2025/2026 Catalog)

**Subject Area: (prefix)**

PHYS - Physics

**Catalog Number: (course number)**

224

**Course ID: (For administrative use only.)**

TBD

**Units:**

3

**Is the ONLY purpose of this change to update the term typically offered or the enforcement of existing requisites at registration?**

No

**In what term(s) will this course typically be offered?**

Spring term only

**Does this course require a room for its final exam?**

Yes, final exam requires a room

**Does this course replace an existing experimental course?**

No

**This course complies with the credit hour policy:**

Yes

**Justification for course proposal:**

Physics 224 is one of the core courses being proposed as part of a new Master of Science in Physics. The MS program is designed to allow flexibility for students to prepare for PhD programs or to prepare for a career in teaching, industry or government. Statistical mechanics is foundational for conducting research in nearly every branch of physics.

**Course Description: (Not to exceed 90 words and language should conform to catalog copy.)**

Foundations of thermodynamics and classical and quantum statistical mechanics, including Boltzmann and quantum statistical distributions, with applications to properties of gases, specific heats of solids, paramagnetism, black-body radiation, and Bose-Einstein condensation; Boltzmann transport equation and transport properties of gases; and Brownian motion and fluctuation phenomena.

**Are one or more field trips required with this course?**

No

**Fee Course?**

No

**Is this course designated as Service Learning?**

No

**Is this course designated as Curricular Community Engaged Learning?**

No

**Does this course require safety training?**

No

**Does this course require personal protective equipment (PPE)?**

No

**Does this course have prerequisites?**

Yes

**Prerequisite:**

PHYS 150 and PHYS 156, or Instructor Permission

**Prerequisites Enforced at Registration?**

Yes

**Does this course have corequisites?**

No

**Graded:**

Letter

**Approval required for enrollment?**

No Approval Required

**Course Component(s) and Classification(s):**

Lecture

**Lecture Classification**

CS#02 - Lecture/Discussion (K-factor=1WTU per unit)

**Lecture Units**

3

**Is this a paired course?**

No

**Is this course crosslisted?**

No

**Can this course be repeated for credit?**

No

**Can the course be taken for credit more than once during the same term?**

No

**Description of the Expected Learning Outcomes and Assessment Strategies:**

List the Expected Learning Outcomes and their accompanying Assessment Strategies (e.g., portfolios, examinations, performances, pre-and post-tests, conferences with students, student papers). Click the plus sign to add a new row.

	Expected Learning Outcome	Assessment Strategies
1	Apply advanced statistical concepts (such as kinetic theory and Bose-Einstein statistics) to describe multi-particle systems.	Examinations, homework, and quizzes
2	Compute the partition function for various systems of particles including the ideal and photon gas.	Examinations, homework, and quizzes
3	Evaluate physical systems such as electron and atomic gases to determine the relevant statistical distribution.	Examinations, homework, and quizzes
4	Calculate the thermodynamic properties of a system from its statistical distribution.	Examinations, homework, and quizzes
5	Use the equation of state to describe phase transitions for various systems.	Examinations, homework, and quizzes

**Attach a list of the required/recommended course readings and activities:**

PHYS 224 StatMech.docx

**For whom is this course being developed?**

Majors in the Dept

**Is this course required in a degree program (major, minor, graduate degree, certificate?)**

Yes

**Has a corresponding Program Change been submitted to Workflow?**

No

**Identify the program(s) in which this course is required:**

**Programs:**

MS in Physics

**Does the proposed change or addition cause a significant increase in the use of College or University resources (lab room, computer)?**

No

**Will there be any departments affected by this proposed course?**

No

**I/we as the author(s) of this course proposal agree to provide a new or updated accessibility checklist to the Dean's office prior to the semester when this course is taught utilizing the changes proposed here.**

I/we agree

**University Learning Goals**

**Graduate (Masters) Learning Goals:**

Disciplinary knowledge  
Critical thinking/analysis

**Is this course required as part of a teaching credential program, a single subject, or multiple subject waiver program (e.g., Liberal Studies, Biology) or other school personnel preparation program (e.g., School of Nursing)?**

No

**Is this a Graduate Writing Intensive (GWI) course?**

No

Key: 14765