

## COURSE OUTLINE

### Solid State Physics I (22642) A01, Unit Value: 1.5 units

Lectures: 10:30 am–11:20 am, T/W/F, in-person



*We acknowledge and respect the Lək̓ʷəŋən (Songhees and Esquimalt) Peoples on whose territory the university stands, and the Lək̓ʷəŋən and WSÁNEĆ Peoples whose historical relationships with the land continue to this day.*

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### COURSE DESCRIPTION

This course introduces the fundamental principles of solid-state physics, focusing on the structure and physical properties of crystalline solids. Topics include crystal lattices, diffraction and reciprocal space, lattice vibrations and phonons, thermal properties of solids, electronic structure and energy bands, semiconductors, electrical transport, and basic magnetism. The course also introduces collective spin excitations such as magnons and an overview of superconductivity.

### PREREQUISITES & COREQUISITES

Completed or concurrently enrolled PHYS323, PHYS326, PHYS301 or MATH342 or MATH346

### CONTACT INFORMATION

Instructor: Dr. Byoung C. Choi  
Email: bchoi@uvic.ca  
Office: ELL 103  
Office Hours: Fridays 1–2 pm (or by appointment)

### COURSE MATERIALS

Textbook: “Introduction to Solid State Physics” by Charles Kittel

Lecture slides will be available on Brightspace after each class. The slides are not intended to serve as complete lecture notes, so students are expected to take their own notes during lectures.

## LEARNING OUTCOMES

Upon completion of this course, students should be able to:

- Describe and analyze crystal structures, reciprocal lattices, and diffraction phenomena in crystalline solids.
- Apply scattering and lattice-dynamics concepts to explain phonons, phonon spectra, and thermal properties of solids.
- Use free-electron and energy-band models to explain the electronic properties of metals and semiconductors.
- Analyze charge transport in solids, including carrier concentration, electrical conductivity, and mobility.
- Explain the fundamental concepts of magnetism and collective excitations such as magnons.
- Demonstrate a basic understanding of superconductivity and its key physical principles.

## EVALUATION

Weekly Assignments	10%
Midterm Exam	30% (held in class; the date will be announced by the instructor)
Final Exam	60% (date and time scheduled by the University)

### Note:

- *Assignments are posted on the PHYS 328 Brightspace site on Tuesdays.*
- *Due 1 week after being assigned.*
- *Submit your completed assignment (in PDF format) in Brightspace. (A 20%/day late submission penalty applies.)*

## COURSE POLICIES

### Academic Integrity

UVic's Policy on Academic Integrity is found at [uvic.ca/calendar/future/undergrad/index.php#/home](http://uvic.ca/calendar/future/undergrad/index.php#/home). It is every student's responsibility to be aware of this policy, including policies on cheating, plagiarism, unauthorized use of an editor, multiple submission, and aiding others to cheat. If you have any questions or doubts, please talk to me. For more information, see [uvic.ca/learningandteaching/cac](http://uvic.ca/learningandteaching/cac).

### Use of AI

Please note that the use of generative AI tools is not permitted in this course. All course activities can be successfully completed without the use of generative AI. Students must not use tools such as ChatGPT or any other AI-based content generation systems for coursework. As the University of Victoria states on its Academic Integrity Policy "Academic integrity requires commitment to the values of honesty, trust, fairness, respect, and responsibility." Therefore, I expect you to comply with the course syllabus and I encourage you to enhance your academic experience in this course by refraining from use of generative AI.

## COURSE CALENDAR AND OUTLINE

UVic Important Dates: [uvic.ca/calendar/dates/](http://uvic.ca/calendar/dates/)

Week	Lecture Material (Approximate)
1	Structure of Crystals, Primitive Lattice Vectors
2	Miller Indices, Diffraction and Reciprocal Lattice
3	Primitive vectors of reciprocal lattices, Diffraction Condition
4	Scattering – Structure factor & Atomic form factor, Crystal Binding
5	Crystal vibrations - Phonons
6	Phonon density of states, Inelastic neutron scattering
7	Phonon – Thermal properties
8	Free electrons, Heat capacity & Thermal conductivity in metals
9	Energy bands, Semiconductor, Carrier concentration
10	Electrical conductivity & mobility, Basic concept of magnetism
11	Paramagnetism, Ferromagnetism, spin waves - magnons
12	Superconductivity

## CHANGES DUE TO UNFORESEEN CIRCUMSTANCES

The above schedule, policies, procedures, and assignments in this course are subject to change in the event of extenuating circumstances. In the event of significant changes, a revised outline will be posted/circulated.

## UVIC GRADING SYSTEM – UNDERGRADUATE

As per the [Academic Calendar](#):

Grade	Grade Point Value	Grade Scale	Description
A+	9	90 – 100%	<b>Exceptional, outstanding</b> and <b>excellent</b> performance. Normally achieved by a minority of students. These grades indicate a student who is self-initiating, exceeds expectation and has an insightful grasp of the subject matter.
A	8	85 – 89%	
A-	7	80 – 84%	
B+	6	77 – 79%	<b>Very good, good</b> and <b>solid</b> performance. Normally achieved by the largest number of students. These grades indicate a good grasp of the subject matter or excellent grasp in one area balanced with satisfactory grasp in the other area.
B	5	73 – 76%	
B-	4	70 – 72%	
C+	3	65 – 69%	<b>Satisfactory</b> , or <b>minimally satisfactory</b> . These grades indicate a satisfactory performance and knowledge of the subject matter.
C	2	60 – 64%	
D	1	50 – 59%	<b>Marginal</b> Performance. A student receiving this grade demonstrated a superficial grasp of the subject matter.



Grade	Grade Point Value	Grade Scale	Description
F	0	0 – 49%	<b>Unsatisfactory</b> performance. Wrote final examination and completed course requirements; no supplemental.
N	0	0 – 49%	Did not write examination or complete course requirements by the end of term or session; no supplemental.

### COURSE FEEDBACK

I value your feedback on this course. Towards the end of term, as in all other courses at UVic, you will have the opportunity to complete an anonymous **Course Evaluation Survey (CES)** regarding your learning experience. The survey is important for providing feedback to me regarding the course and my teaching, as well as to help the department improve the overall program for students in the future. The survey is accessed online and can be done on your laptop, tablet, or mobile device. I will remind you and provide you with more detailed information nearer the time, but please be thinking about this important activity during the course.



## APPENDICES

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### DEPARTMENT OF PHYSICS AND ASTRONOMY INFORMATION

- Department Website: [uvic.ca/science/physics/index.php](http://uvic.ca/science/physics/index.php)
  - Department General Office: [physgen@uvic.ca](mailto:physgen@uvic.ca)
  - Department Undergraduate Advisor: [phast\\_advising@uvic.ca](mailto:phast_advising@uvic.ca)
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### UNIVERSITY STATEMENTS & POLICIES

- Academic Calendar: [Information for All Students](#)
  - [Creating a respectful, inclusive, and productive learning environment](#)
  - [Accommodation of Religious Observance](#)
  - [Accommodation and Access for Students with Disabilities](#)
  - [Student Conduct](#)
  - [Non-academic Student Misconduct](#)
  - [Accessibility](#)
  - [Diversity / EDI](#)
  - [Equity Statement](#)
  - [Sexualized Violence Prevention and Response](#)
  - [Discrimination and Harassment Policy](#)
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## STUDENT RESOURCES

### POSITIVITY AND SAFETY

The University of Victoria is committed to promoting, providing, and protecting a positive and safe learning and working environment for all its members.

[Student Groups & Resources](#)

### ACADEMIC RESOURCES

UVic Library - *UVic Library offers many services and resources for undergraduate and graduate students.*

[uvic.ca/students/academics/library-services](http://uvic.ca/students/academics/library-services)

Learning Resources - *UVic Learn Anywhere is the primary learning resource for students that offers many learning workshops and resources to help students with academics and learning strategies.*

[onlineacademiccommunity.uvic.ca/uviclearn/](https://onlineacademiccommunity.uvic.ca/uviclearn/)

Centre for Academic Communication - *Offers online and in-person one-on-one tutorials, workshops, and more.*

[uvic.ca/learningandteaching/cac](https://uvic.ca/learningandteaching/cac)

Physics Aid Service – *Addresses problems with conceptual understanding, difficulties encountered with homework assignments, preparation for mid-term and final exams, and occasionally even preparation for external exams such as the MCAT. Instruction may be one-to-one or in small groups, with emphasis placed on engaged interaction between the students and the instructor.*

<https://www.uvic.ca/science/physics/current/undergraduate/pas/index.php>

## **MENTAL HEALTH & WELLNESS**

A note to remind you to take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, getting enough sleep, and taking some time to relax. This will help you achieve your goals and cope with stress. All of us benefit from support during times of struggle. You are not alone.

Student Wellness Centre - *Our team of practitioners offers a variety of services to support students' mental, physical, and spiritual health.*

[uvic.ca/student-wellness](https://uvic.ca/student-wellness)

Counselling Services - *Counselling Services can help you make the most of your university experience. They offer free professional, confidential, inclusive support to currently registered UVic students.*

[uvic.ca/student-wellness](https://uvic.ca/student-wellness)

Health Services - *University Health Services (UHS) provides a full-service primary health clinic for students and coordinates healthy student and campus initiatives.*

[uvic.ca/student-wellness](https://uvic.ca/student-wellness)

## **ACCESSIBILITY**

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a documented disability or health consideration that may require accommodations, please feel free to approach me and/or the Centre for Accessible Learning (CAL) as soon as possible.

Centre for Accessible Learning - *The CAL staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.*

[uvic.ca/accessible-learning](https://uvic.ca/accessible-learning)

## ADVISING

For academic advising-related questions, students in the Department of Physics & Astronomy are also encouraged to meet with the Undergraduate Advisor ([phast\\_advising@uvic.ca](mailto:phast_advising@uvic.ca)) as well as an academic advisor in the Academic Advising Centre early in their studies to help map out a plan to declare a major and complete university program requirements.

Academic Advising Centre - *Academic advice and support is currently available by phone, email and virtual or in-person appointments.* [uvic.ca/services/advising](https://uvic.ca/services/advising)

Ombudsperson - *The ombuds office is an independent, impartial, and confidential resource for undergraduate and graduate students and other members of the University of Victoria community. The ombudsperson helps resolve student problems or disputes fairly.* [uvicombudsperson.ca](https://uvicombudsperson.ca)

## ACADEMIC CONCESSION

You can request an academic concession if your course requirements are affected by unexpected and unavoidable circumstances, or conflicting responsibilities. Concession requests can be for an in-course extension, deferral, withdrawal under extenuating circumstances, or an aegrotat. Please speak to an advisor at the Academic Advising Centre if you have questions on how requesting a concession will affect your academic program.

Undergraduate Academic Concessions - [uvic.ca/students/academics/academic-concessions-accommodations](https://uvic.ca/students/academics/academic-concessions-accommodations)

## EQUITY AND HUMAN RIGHTS AT UVIC

EQHR is a resource for students, staff, and faculty who have experienced sexualized violence, discrimination, and/or harassment and are looking for informal and/or formal resolution options as well as advice, coaching, and/or education. We are available for confidential consultations so that you can ask questions and learn your options.

EQHR – By email at [eqhr01@uvic.ca](mailto:eqhr01@uvic.ca) or in-person (Sedgewick C115). [uvic.ca/equity](https://uvic.ca/equity)

Sexualized Violence Resource Office – *If you have been directly or indirectly impacted by sexualized violence, reach out to the SVRO for information, advice, and resolution options (restorative and disciplinary) as well as support options and referrals. The SVRO is both survivor-centred and trauma-informed in their approach. You can reach us by phone at 250-721-8021 or by email at [eqhr01@uvic.ca](mailto:eqhr01@uvic.ca) to book either an in-person (Sedgewick C119) or online appointment.* [uvic.ca/sexualizedviolence](https://uvic.ca/sexualizedviolence)

## RESOURCES FOR INTERNATIONAL STUDENTS

International Centre for Students - *The primary office supporting international students on campus at the university-wide level.* [uvic.ca/international-experiences](https://uvic.ca/international-experiences)

UVic Global Community Initiative - *Provides various supportive programming, including a Mentorship Program and Conversation Partner Program.* [uvic.ca/international-experiences/get-involved/uvic-global-community](https://uvic.ca/international-experiences/get-involved/uvic-global-community)



## **RESOURCES FOR INDIGENOUS STUDENTS**

Indigenous Student Support - *UVic offers holistic services to Indigenous students throughout their academic journey. [uvic.ca/students/info-for/indigenous-students](http://uvic.ca/students/info-for/indigenous-students)*

Elders in Residence - *The Office of Indigenous Academic and Community Engagement (IACE) has the privilege of assembling a group of Elders from local communities to guide students, staff, faculty, and administration in Indigenous ways of knowing and being. [uvic.ca/iace/](http://uvic.ca/iace/)*