

UNIVERSITY OF CALIFORNIA MERCED

DEPARTMENT OF PHYSICS

Merced, California 95343
<http://physics.ucmerced.edu/>

General University Information

Chancellor: Juan Sánchez Muñoz
Dean of Graduate School: Christopher Kello
University website: <http://www.ucmerced.edu/>
School Type: Public
Setting: Rural
Total Faculty: 420
Total Graduate Faculty: 256
Total number of Students: 8,847
Total number of Graduate Students: 696

Department Information

Department Chair: Prof. Ajay Gopinathan, Chair
Department Contact: Linda Hirst, Admissions chair
Total full-time faculty: 21
Total number of full-time equivalent positions: 21
Full-Time Graduate Students: 61
Female Full-Time Graduate Students: 16
First-Year Graduate Students: 11
Female First-Year Students: 1
Total Post Doctorates: 6

Department Address

5200 N. Lake Road
Merced, CA 95343
Phone: (209) 228-3368
E-mail: lhirst@ucmerced.edu
Website: <http://physics.ucmerced.edu/>

ADMISSIONS

Admission Contact Information

Address admission inquiries to: Graduate Division, University of California, Merced, 5200 N. Lake Road, SSB 310, Merced, CA 95343
Phone: (209) 228-3368
E-mail: gradadmissions@ucmerced.edu
Admissions website: <https://graduatedivision.ucmerced.edu/prospective-students>

Application deadlines

Fall admission:
U.S. students: January 15 *Int'l. students:* January 15

Application fee

U.S. students: \$120 *Int'l. students:* \$140

Applications received by 15 Dec 2020 will receive priority review. A limited number of graduate application fee waivers are available based on financial need. Contact admissions chair to request. See also <http://physics.ucmerced.edu/academics/graduate-studies>. Applications for spring admission are possible by special arrangement.

Admissions information

For Fall of 2020:
Number of applicants: 77
Number admitted: 30
Number enrolled: 11

Admission requirements

Bachelor's degree requirements: Bachelor's degree in physics or a closely related field.
Minimum undergraduate GPA: 3.0

GRE requirements

The GRE is not required.
Not required this year due to COVID-19 disruptions, but normally required. No minimum cut-off is applied in reviewing scores. Official score reports are not needed. We consider applicants' record of coursework and research experience, as shown in transcripts and GPA, statement of purpose, recommendation letters, and test scores, in making our decisions.

GRE Physics requirements

The GRE Physics is not required.
Not required this year due to COVID-19 disruptions, but normally required. No minimum cut-off is applied in reviewing scores. Official score reports are not needed.

TOEFL requirements

The TOEFL exam is required for students from non-English-speaking countries.
Minimum accepted TOEFL scores:
PBT score: 550
iBT score: 80
Either TOEFL or IELTS is required for students from non-English-speaking countries. See full information at <https://graduatedivision.ucmerced.edu/prospective-students/how-apply/international-applicants>.

Other admissions information

Undergraduate preparation assumed: Our preliminary exams test Quantum Mechanics at the level of "Introduction to Quantum Mechanics," by D. J. Griffiths; Electrodynamics at the level of "Introduction to Electrodynamics," by D. J. Griffiths; and Classical Mechanics at the level of "Classical Mechanics" by J. R. Taylor.

TUITION AND ASSISTANTSHIPS

Teaching Assistants, Research Assistants, and Fellowships

Number of first-year
Teaching Assistants: 11
Average stipend per academic year
Teaching Assistant: \$28,924
Research Assistant: \$28,924
Fellowship student: \$28,924

Five years of funding (including tuition and fees) are guaranteed for graduate students in good standing. This funding may take the form of TA positions, research positions, or fellowships. All students are required to TA for one semester, typically done in the first semester.

Tuition year 2020–2021:

Tuition for in-state residents
Full-time students: \$5,721 per semester
Tuition for out-of-state residents
Full-time students: \$13,272 per semester
All tuition for PhD students is covered by appointment as teaching assistant or graduate student researcher, or by fellowships.
Credit hours per semester to be considered full-time: 12
Deferred tuition plan: Yes
Health insurance: \$3,222.78
Other academic fees: \$882.50 total fees for student services, transportation, recreation, etc.
Academic term: Semester
Number of first-year students who received full tuition waivers: 11

FINANCIAL AID**Loans**

Loans are available for U.S. students.

Loans are not available for international students.

GAPSFAS application required: No

FAFSA application required: Yes

For further information

Address financial aid inquiries to: University of California, Merced, ATTN: Graduate Division, 5200 N. Lake Road, SSB 310, Merced, CA 95343.

Phone: (209) 228-4622

E-mail: gradfunding@ucmerced.edu

Financial aid website: <http://graduatedivision.ucmerced.edu/financial-support>

HOUSING**Availability of on-campus housing**

Single students: No

Married students: No

Childcare Assistance: Yes

For further information

Address housing inquiries to: UC Merced Housing & Residential Life, 5200 N. Lake Road, Merced, CA 95343.

Phone: (209) 228-4663

E-mail: housing@ucmerced.edu

Housing aid website: <http://housing.ucmerced.edu/>

Table A—Faculty, Enrollments, and Degrees Granted

Research Specialty	2020–2021 Faculty	Enrollment Fall 2020		Number of Degrees Granted 2019–2020 (2007–19)		
		Mas- ter's	Doc- torate	Mas- ter's	Termi- nal Master's	Doc- torate
Astrophysics	2	–	2	–	–	–
Atomic, Molecular, & Optical Physics	5	–	13	–(4)	–	3(19)
Condensed Matter, Nanoscience and Energy	5	–	20	2(1)	–	2(14)
Soft Matter and Biophysics	7	–	23	2(2)	–	4(11)
Total	19	–	58	–(6)	–(1)	9(44)
Full-time Grad. Stud.	–	–	70	–	–	–
First-year Grad. Stud.	–	–	11	–	–	–

GRADUATE DEGREE REQUIREMENTS

Master's: Students are normally only admitted to the graduate program in Physics to work toward the Ph.D. degree. Requirements for the M.S. degree: Complete at least two semesters of full-time academic residence (12 units minimum) at UC Merced; Pass the preliminary examinations on undergraduate-level classical mechanics, quantum mechanics, and electromagnetism; Complete at least 24 semester hours of upper-division and graduate course work with a cumulative grade-point average of at least 3.0. At least 16 semester hours must be from regular, letter-graded lecture or discussion courses, while the remaining 8 hours may be research or similar courses; Pass a comprehensive oral examination administered by the faculty committee of at least 3 members. This examination will test the student's understanding of the main concepts in the field at the graduate level.

Doctorate: The recipient of a Ph.D. degree is understood to possess thorough knowledge of a broad field of learning and to have given evidence of distinguished accomplishment in that field; the degree is a warrant of critical ability and powers of imaginative synthesis. The degree also signifies that the recipient has presented a doctoral dissertation containing an original contribution to knowledge in his or her chosen field of study. To complete a Ph.D. degree in physics at UC Merced students are required to: Complete at least four semesters of full-time academic residence (12 units minimum) at UC Merced; Complete the required courses with a letter grade of at least "B" in each course ("S" in seminar courses graded S/U); Serve as a teaching assistant for at least one semester; Pass the preliminary examinations on undergraduate-level classical mechanics, quantum mechanics, and electromagnetism; Pass the oral Ph.D. qualifying examination; Present and successfully defend a doctoral dissertation containing an original contribution to knowledge in the field. Required courses are classical mechanics, statistical mechanics, quantum mechanics, and electrodynamics. Electives include condensed matter, biophysics, soft matter, atomic physics, modern optics, and quantum information.

SPECIAL EQUIPMENT, FACILITIES, OR PROGRAMS

As the 10th campus of the University of California, UC Merced draws on the outstanding resources of the UC system, a world-renowned center for research and education. Physics graduate students have access to major facilities, such as state-of-the-art lasers, electron microscopes, a nanofabrication facility, a high-performance computing cluster, and an NMR on campus. Other large facilities, such as synchrotron light sources, are located at Stanford, Lawrence Livermore, and Lawrence Berkeley National Laboratories, which are within two hours' drive and are routinely used by students and faculty members. We collaborate extensively with other nearby institutions such as UC Berkeley, Davis, Santa Cruz, and San Francisco. Students have access to the extensive library holdings and journal subscriptions of the UC system. Physics students work with several federally funded centers at UC Merced that the department leads or participates in, which promote education, research, and training for underrepresented minorities: the Center for Cellular and Biomolecular Machines (NSF), the Merced nAnomaterials Center for Energy and Sensing (NASA), an NSF Research Traineeship program in Interdisciplinary Computational Graduate Education, and the Consortium for High-Energy Density Science (NNSA).

Table B—Separately Budgeted Research Expenditures by Source of Support

Source of Support	Departmental Research	Physics-related Research Outside Department
Federal government	\$1,368,000	
State/local government	\$553,000	
Non-profit organizations		
Business and industry		
Other	\$351,000	
Total	\$2,272,000	

FACULTY**Professor**

Ghosh, Sayantani, Ph.D., University of Chicago, 2003. *Applied Physics, Atomic, Molecular, & Optical Physics, Condensed Matter Physics, Energy Sources & Environment, Low Temperature Physics, Nano Science and Technology, Optics.* Ex-

perimental condensed matter physics; magnetism, strongly correlated systems, spintronics, quantum information.

Gopinathan, Ajay, Ph.D., University of Chicago, 2003. Department chair, co-director of CCBM. *Biophysics, Computational Physics, Condensed Matter Physics, Energy Sources & Environment, Nonlinear Dynamics and Complex Systems, Polymer Physics/Science, Statistical & Thermal Physics, Theoretical Physics*. Theoretical biophysics, biopolymer structure-dynamics and function, molecular motors, intracellular transport, cell migration, collective motion, active matter, non-equilibrium systems and soft condensed matter.

Hirst, Linda S., Ph.D., University of Manchester, 2001. Admissions committee chair. *Applied Physics, Biophysics, Condensed Matter Physics, Nano Science and Technology, Polymer Physics/Science*. Experimental soft matter physics and biophysics: liquid crystals, soft nanocomposites, biopolymers, membranes and active matter.

Mitchell, Kevin, Ph.D., University of California, Berkeley, 2000. *Atomic, Molecular, & Optical Physics, Biophysics, Computational Physics, Fluids, Rheology, Nonlinear Dynamics and Complex Systems, Theoretical Physics*. Nonlinear dynamics and chaos, with applications to AMO (atomic, molecular, and optical) physics and fluid dynamics.

Tian, Lin, Ph.D., Massachusetts Institute of Technology, 2002. *Atomic, Molecular, & Optical Physics, Condensed Matter Physics*. Theoretical questions in solid-state quantum computing, quantum simulation, hybrid quantum systems, optomechanics, decoherence, and noise models.

Winston, Roland, Ph.D., University of Chicago, 1963. Director of UC Solar. *Energy Sources & Environment, High Energy Physics, Optics, Particles and Fields, Other*. Solar power and renewable energy; elementary particle physics; non-imaging optics.

Associate Professor

Scheibner, Michael, Ph.D., University of Würzburg, 2006. *Applied Physics, Atomic, Molecular, & Optical Physics, Condensed Matter Physics, Low Temperature Physics, Nano Science and Technology, Optics, Quantum Foundations*. Experimental quantum science and technology for applications in sensing, metrology, phononics, photonics, materials engineering, information processing, resource sustainability and extreme environments.

Sharping, Jay E., Ph.D., Northwestern University, 2003. *Atomic, Molecular, & Optical Physics, Biophysics, Engineering Physics/Science, Optics*. Ultrafast laser technology and applications in physics, chemistry, and biology.

Xu, Jing, Ph.D., University of California, Santa Barbara, 2006. *Biophysics, Condensed Matter Physics, Nonlinear Dynamics and Complex Systems*. Experimental biophysics, soft condensed matter physics, and nonlinear dynamics and complex systems, with interest in biomaterials including molecular motors and microtubules; research methods include optical trapping, fluorescence microscopy, and Monte Carlo simulations.

Assistant Professor

Beller, Daniel, Ph.D., University of Pennsylvania, 2014. *Biophysics, Computational Physics, Condensed Matter Physics, Fluids, Rheology, Nonlinear Dynamics and Complex Systems, Statistical & Thermal Physics, Theoretical Physics*. Theoretical soft condensed matter, liquid crystals, active matter, and biophysics.

Cai, Hui, Ph.D., Arizona State University, 2018. *Condensed Matter Physics, Materials Science, Metallurgy, Nano Science and Technology*. Experimental condensed matter and materials science, synthesis, electronic and optical properties of quantum materials and 2D materials.

Chien, Chih-Chun, Ph.D., University of Chicago, 2009. Chair of graduate group. *Atomic, Molecular, & Optical Physics, Condensed Matter Physics, Nano Science and Technology*. Theoretical atomic and molecular physics, theoretical condensed matter physics, geometrical and topological effects in physics, thermal transport, hybrid quantum systems.

Dasbiswas, Kinjal, Ph.D., University of Florida, 2012. *Biophysics, Computational Physics, Condensed Matter Physics, Fluids, Rheology, Low Temperature Physics, Mechanics, Nonlinear Dynamics and Complex Systems, Statistical & Thermal Physics, Theoretical Physics*. Theoretical biological physics and soft condensed matter: cell and tissue physics, mechanobiology, pattern formation, active matter and biological materials.

Kleckner, Dustin P., Ph.D., University of California, Santa Barbara, 2010. *Condensed Matter Physics, Electromagnetism, Fluids, Rheology, Nonlinear Dynamics and Complex Systems, Optics, Statistical & Thermal Physics*. Experiments on geometry and topology in soft matter and fluids.

Liu, Bin, Ph.D., New York University, 2006. *Biophysics, Computational Physics, Fluids, Rheology, Nonlinear Dynamics and Complex Systems, Polymer Physics/Science*. Experimental soft condensed matter physics, biophysics, biological transport, non-Newtonian fluids, and mechanical metamaterials.

Loebman, Sarah, Ph.D., University of Washington, 2013. *Astrophysics, Computational Physics*. Computational astrophysics: galaxy evolution, dark matter, and chemo-dynamics in the Local Universe, using high-resolution galaxy simulations, survey data and Big Data.

Nierenberg, Anna M., Ph.D., University of California, Santa Barbara, 2014. *Astronomy, Astrophysics*. Observational astrophysics: strong gravitational lensing constraints of dark matter, low-mass galaxy formation and evolution.

Strubbe, David, Ph.D., University of California, Berkeley, 2012. Admissions committee vice-chair. *Chemical Physics, Computational Physics, Condensed Matter Physics, Materials Science, Metallurgy, Nano Science and Technology, Solid State Physics*. Theoretical condensed matter and materials science, electronic and optical properties, 2D materials, amorphous materials, photovoltaics, nanoscience, high-performance computing, electronic structure methods.

Professor Emeritus

Chiao, Raymond, Ph.D., Massachusetts Institute of Technology, 1965. *Atomic, Molecular, & Optical Physics, Condensed Matter Physics, Nano Science and Technology, Optics, Quantum Foundations, Relativity & Gravitation*. Nonlinear and quantum optics, experiment, and theory; detection and generation of gravitational radiation via quantum mechanical systems, such as a pair of charged mini-magnets levitated above superconductors (in collaboration with Prof. Sharping).

Teaching Professor

Utter, Brian, Ph.D., Cornell University, 2001. *Condensed Matter Physics, Fluids, Rheology, Nonlinear Dynamics and Complex Systems*. Experimental soft condensed matter physics, granular matter, and multiphase flow.

Teaching Associate Professor

Menke, Carrie, Ph.D., University of California, Irvine, 2005. *Physics and other Science Education*. Physics education.

DEPARTMENTAL RESEARCH SPECIALTIES AND STAFF

Theoretical

Astrophysics. Computational astrophysics: galaxy evolution, dark matter, and chemo-dynamics in the Local Universe, using high-resolution galaxy simulations, survey data and Big Data. Loebman.

Atomic, Molecular, & Optical Physics. The ability to manipulate matter at the atomic scale and its interactions with light has led to transformative advances in atomic, molecular and optical physics (AMO). Research areas include theoretical nonlinear dynamics for atomic and molecular systems, and quantum optics and quantum information in nanoscale systems including superconducting quantum computing, semiconductor optics, and nanomechanics. Chien, Mitchell, Tian.

Biophysics. Biophysics is by definition an interdisciplinary science where ideas and techniques from physics (including soft condensed matter physics) are utilized to understand biological systems and phenomena. The biophysics group at UC Merced collaborates extensively between theory and experiment, and with chemistry, biology, applied math, and bio-engineering groups. Research areas include intrinsically disordered proteins, cell mechanics, intracellular transport, collective cellular motility, active matter, liquid crystals, fluids, self-organization and self-assembly. Beller, Dasbiswas, Gopinathan.

Condensed Matter Physics. Condensed matter physics investigates the physical, electronic, and magnetic properties of the various forms of solid and liquid matter, ranging from naturally occurring crystals to engineered micro- and nano-structures as well as more exotic condensed phases and phenomena such as superconductivity and the quantum Hall effect. Research areas include optoelectronic and photovoltaic materials, nanoscience, strongly correlated systems, quantum information processing and magneto-optical phenomena, optical properties of nanostructures, and theoretical and computational tools for condensed-matter physics. Chien, Strubbe, Tian.

Interdisciplinary studies with affiliated faculty. Physics students may also carry out their graduate research with one of these groups: Venkatraman Ayyaswamy: plasma physics (mechanical engineering); Mike Colvin: biomolecular simulation (chemistry and chemical biology); Arvind Gopinath: soft matter and biophysics (bioengineering); Shilpa Khatri: fluid dynamics (applied mathematics); Elizabeth Nowadnick: computational materials (materials and biomaterials science and engineering); Aurora Pribram-Jones: theoretical chemistry (chemistry and chemical biology).

Nano Science and Technology. The ability to fabricate, control, and study matter on the nanometer scale has opened up new possibilities in science and technology. Research areas include optical properties of nanostructures, quantum optics and quantum information in nanoscale systems, superconducting quantum computing, semiconductor optics, and nanomechanics. Chien, Strubbe, Tian.

Nonlinear Dynamics and Complex Systems. Most processes encountered in nature are inherently nonlinear. Nonlinear dynamics and statistical physics find applications across a wide range of disciplines from mathematics and physics to chemistry, biology, and engineering. Research areas include chaotic dynamics, thermal transport, collective phenomena in swarming and foraging, anomalous transport in complex environments, and fundamental studies of topological dynamics. Beller, Chien, Dasbiswas, Gopinathan, Mitchell.

Soft Matter. Soft condensed matter is the study of materials that are neither crystalline solids, nor simple liquids — they are somewhere in between. Everyday examples of soft matter in-

clude soaps, paints, gels, plastics, liquid crystals, and most of your own body and the food you eat. Research areas include liquid crystals, active matter, and polymer physics and elasticity. Beller, Dasbiswas, Gopinathan.

Experimental

Astrophysics. Observational astrophysics: strong gravitational lensing constraints of dark matter, low-mass galaxy formation and evolution. Nierenberg.

Atomic, Molecular, & Optical Physics. The ability to manipulate matter at the atomic scale and its interactions with light has led to transformative advances in atomic, molecular and optical physics (AMO). Research areas include photonic and electronic coupling for applications in quantum information, non-imaging optics, laboratory research at the boundary between relativity and quantum mechanics, ultrafast laser systems and their applications, and use of optical traps to manipulate nature's nano-machines: molecular motors. Ghosh, Scheibner, Sharping, Winston, Xu.

Biophysics. Biophysics is by definition an interdisciplinary science where ideas and techniques from physics (including soft condensed matter physics) are utilized to understand biological systems and phenomena. The biophysics group at UC Merced collaborates extensively between theory and experiment, and with chemistry, biology, applied math, and bio-engineering groups. Research areas include single-molecule biophysics, molecular motors, bacterial motility, biomaterials, biopolymers, soft nanocomposites, active matter, liquid crystals, mechanical metamaterials, colloids and complex fluids. Hirst, Liu, Sharping, Xu.

Condensed Matter Physics. Condensed matter physics investigates the physical, electronic, and magnetic properties of the various forms of solid and liquid matter, ranging from naturally occurring crystals to engineered micro- and nano-structures as well as more exotic condensed phases and phenomena such as superconductivity and the quantum Hall effect. Research areas include optoelectronic and photovoltaic materials, quantum sensing, nanoscience, strongly correlated systems, quantum information processing and magneto-optical phenomena, optical properties of nanostructures, and emergence of complex phenomena when transitioning from single molecule to small ensemble studies. Cai, Chiao, Ghosh, Scheibner, Xu.

Interdisciplinary studies with affiliated faculty. Physics students may also carry out their graduate research with one of these groups: Mehmet Z. Baykara: tribology and surface science (mechanical engineering); Sarah Kurtz: solar energy (materials and biomaterials science and engineering); Jennifer Lu: functional material synthesis (materials and biomaterials science and engineering); Victor Muñoz: biophysics of proteins (bioengineering); Alex Noy: biomaterials (Lawrence Livermore National Laboratory); Anand Subramaniam: biomaterials (bioengineering); Tao Ye: bio/nano interfaces (chemistry and chemical biology).

Nano Science and Technology. The ability to fabricate, control, and study matter on the nanometer scale has opened up new possibilities in science and technology. Research areas include directed assembly of nanostructures for information and energy transfer, optical properties of nanostructures, and combination of physics and biochemistry methodologies to tune the nano-machinery of molecular motors. Cai, Ghosh, Hirst, Scheibner, Xu.

Soft Matter. Soft condensed matter is the study of materials that are neither crystalline solids, nor simple liquids — they are somewhere in between. Everyday examples of soft matter include soaps, paints, gels, plastics, liquid crystals and most of your own body and the food you eat. Research areas include liquid crystals, active matter, polymer physics and elasticity,

fluid dynamics and granular systems, membranes, and experiments on geometry and topology in soft matter and fluids. Hirst, Kleckner, Liu, Utter.

Solar and Energy Sciences. As the first new research university in the 21st century, UC Merced was established with the mission to address new challenges facing humanity, including development of inexpensive renewable energy. Research areas include design of novel optics for light energy collection and

development of novel materials for energy conversion. The University of California Advanced Solar Technologies Institute (UC Solar) is a multi-campus research institute across the UC system. Headquartered at UC Merced, UC Solar conducts cross-disciplinary research that leads to new and improved solar energy generation technologies and educates the energy industry and the next generation of energy scholars. Ghosh, Hirst, Strubbe, Winston.

View additional information about this department at www.gradschoolshopper.com. Check out the “Why Choose Us?” section, find out more about the department’s culture and get links to social media networks.