

# Physics

## Department of Physics

Physics is devoted to the discovery and exploration of the basic physical laws governing our material universe. A physicist attempts to express these laws in their most simple mathematical form so they can be applied to predict the behavior of all forms of matter and energy, from the subatomic physics of quarks, gluons, nuclei, and atoms, to the astrophysics of planets, stars, black holes, galaxies, and larger scale structures of the universe. The knowledge obtained from investigating physical phenomena forms the foundation for modern technologies ranging from lasers used in high-speed communications and surgery, to quantum and molecular electronics used in modern electrical devices, the magnetic behavior of the thin films used for computer hard drives, and the radiation detectors and optical elements used in space telescopes. The fundamental knowledge gained by physicists helps shape and improve the quality of modern life.

Missouri S&T's physics department provides numerous opportunities for you to participate in cutting-edge, nationally-funded scientific research supervised by departmental faculty. Topics studied by Missouri S&T undergraduates include collisions between electrons, atoms, and ions; the magnetic properties of nano scale thin films and other highly magnetic materials; exotic interactions in atoms and molecules excited with ultra fast lasers; electrically generated luminescence in polymers; quantum phase transitions, and atmospheric changes induced by manmade pollutants.

The department strongly encourages undergraduates to participate in the many research projects available. Those who do, often present their work at research competitions throughout the state and at national scientific meetings. Missouri S&T physics students regularly win prizes for their research accomplishments in the annual Fuller and Missouri Academy of Science competitions.

### Departmental Contact:

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Department Chair: Dr. Dan Waddill

### Degree Options and Minors

Bachelor of Science, Physics  
Master of Science, Physics  
Master of Science, Physics for Teachers  
Doctor of Philosophy, Physics  
Minor, Physics

### Student Organizations and Undergraduate Research

The physics department has active funded research in

- Atomic, molecular, optical physics
- Condensed matter, solid state, materials physics
- Aerosol and environmental physics

Over 60% of physics majors participate in research projects with faculty during their time at Missouri S&T, many resulting in research publications in prestigious scientific journals and presentations at national and international meetings.

### Entry-Level Job Titles

Lab Technician	Program Technician
Teacher	Health Physicist
Research Assistant	Technical Designer
Science Journalist	Various Engineering Positions

### Co-op and Internship Availability

Co-op and summer intern programs are available to students. These programs provide students with the opportunity to integrate their classroom studies with learning through productive work experiences in a field related to a student's academic or career goals.

### Scholarship Information

Freshman scholarships are automatically awarded based on high school transcripts and ACT/SAT scores ranging from \$500-\$2,000. Scholarships for sophomores, juniors and seniors are typically awarded to all majors maintaining a grade point average of 3.50 or higher.

## Faculty

### Professors:

Ronald Bieniek, Ph.D., Harvard  
 Robert Dubois, Ph.D., Nebraska  
 Don Hagen, Ph.D., Purdue  
 Barbara Hale, Ph.D., Purdue  
 Don Madison (Curators'), Ph.D., Florida State  
 Paul Parris, Ph.D., Rochester  
 Jerry Peacher, Ph.D., Indiana  
 Allan Pringle (Curators' Teaching), Ph.D., Missouri-Columbia  
 Michael Schulz (Curators'), Ph.D., Heidelberg  
 Dan Waddill, Ph.D., Indiana  
 Gerald Wilemski, Ph.D., Yale  
 Thomas Vojta, Ph.D., Chemnitz

### Associate Professors:

John Schmitt, Ph.D., Michigan  
 Greg Story, Ph.D., Southern California  
 Julia Medvedeva, Ph.D., Russian Academy of Science

### Assistant Professors:

Alexey Yamilov, Ph.D., CUNY  
 Ulrich Jentschura, Ph.D., University of Technology Dresden  
 Yew San Hor, Ph.D., University Rutgers

### Adjunct Assistant Professors:

Agnes Vojta, Ph.D., University of Technology Dresden

## Facilities and Technology

Missouri S & T's Physics Department is home to a major internationally recognized research laboratory, the Laboratory for Atomic, Molecular, and Optical Research (LAMOR), and participates in another, the Cloud and Aerosol Science Laboratory (CASL) and The Center for Materials Research. These laboratories participate in and help to organize numerous scientific meetings throughout the world.

## Notes

**Detailed information on course equivalencies, acceptable credits for elective coursework, grade requirements and prerequisites is available from Missouri S&T's Registrar's Office at <http://registrar.mst.edu>.**

## Bachelor of Science

Physics..... 128 credit hours

### FIRST YEAR

	<b>Credit</b>
Chem 1310, 1319, 1320, 1100-General Chemistry .....	9
Elective/History or Political Science .....	3
English 1120-Exposition.....	3
Math 1221-Calculus II/Analytic Geometry .....	5
Math 1208-Calculus I/ Analytic Geometry .....	5
Physics 1101-Intro to Physics .....	1
Physics 1111-General Physics.....	4
Physics 1119 -General Physics Lab.....	<u>1</u>
	31

### SECOND YEAR

Comp Sci 1970, 1980-Scientific Programming .....	3
English 1160-Writing and Research .....	3
Math 3304-Differential Equations .....	3
Math 2222-Calculus III/Analy Geom.....	4
Physics 2311-Modern Physics I .....	3
Physics 2401-Intro to Theoretical Physics.....	3
Physics 2129-Intermediate Phys Lab .....	3
Physics 2111-General Physics.....	4
Physics 2119-Gen Phys Laboratory .....	1
Elective/Social Science .....	3
Elective .....	<u>3</u>
	33

### THIRD YEAR

Physics 3211-Electricity and Magnetism I .....	3
Physics 3311-Modern Physics II .....	3
Physics 3201-Physical Mechanics .....	3
Physics 3119-Advanced Phys Lab I .....	3
Physics 3129-Advanced Phys Lab II .....	3
Elective/Math or Statistics .....	3
Elective/Math or Statistics .....	3
Elective/Free.....	<u>13</u>
	34

### FOURTH YEAR

Physics 4211-Electricity and Magnetism II .....	3
Physics 4301-Quantum Mechanics.....	3
Physics 4311-Thermal Physics .....	3
Physics Elective .....	3
Physics Elective .....	3
Elective/ Humanities or Social Science .....	3
Elective/Free .....	3
Elective/Free .....	3
Elective/Free .....	3
Elective/Free .....	<u>3</u>
	30

Six hours of math beyond Math 3304 are required; e.g., Linear Algebra (Math 3108), Partial Differential Equations (Math 5325), Complex Variables (Math 5351), and Vector/Tensor Analysis (Math 5222) are recommended.

Your choice of electives must include six hours of humanities and six hours of social sciences. Twenty-five hours of free or physics electives are still available for you to explore your interests or to develop an emphasis area. Typical electives cover topics such as astrophysics, computational physics, lasers and quantum electronics, particle physics, atmospheric physics, optical communications, materials science, music, theatre, art and film, advanced mathematics and engineering.