

# Engineering

[www.goshen.edu/physics](http://www.goshen.edu/physics)

## **Why engineering?**

The engineer is the key figure in modern technological society. Engineering makes a reality of the potential value of science by translating scientific knowledge into tools, resources, energy and labor to bring them into the service of society.

The engineer requires the imagination to visualize the needs of society and to appreciate what is possible as well as the technological and broad social understanding to bring this vision to reality.

Engineering offers in turn

- *Job satisfaction*
- *Variety of career opportunities*
- *Challenging work and a creative environment*
- *Intellectual development*
- *Financial security*

As a creative problem solver, the engineer must understand the technical aspects of the problem, and culture and society as well. Goshen College's binary program provides an in-depth understanding of all of these.

## **The program**

The engineering student spends three years as a physics, mathematics or chemistry major at Goshen College. During this time the basis of the physics major, the general education requirements and the international program (SST) are completed. In the third year the student selects the engineering school and a professional direction and preparations for the second step are completed.

The second step is a two or two and a half year term at the engineering school. Two years is a minimum. The co-op program will add a semester. The student then receives a B.A. from Goshen College and a B.S. from the engineering school.

Although an application must be made to the engineering school, acceptance is essentially guaranteed to a Goshen engineering student with a 3.0 overall GPA and the engineering liaison officer's endorsement.

And there is more than the technical side. Goshen College is a nationally ranked liberal arts college. The Goshen engineering major is an integral part of that tradition. Engineering students are often principal contributors to campus music, drama and worship, as well as to the Goshen Research Symposium.

Goshen College is the site of an important annual conference on Religion and Science, which provides a platform for exploration of this arena. The leadership for this conference is in the physics department. Speakers have included cosmologists, philosophers and theologians of international reputation.

At Goshen College we provide more than just the rigors of engineering foundations.

## **Specialties**

Essentially all specialties are included in this program. Among these are

- *Biomedical engineering*
- *Chemical engineering*
- *Civil engineering*
- *Computer engineering*
- *Electrical engineering*
- *Engineering physics*
- *Industrial engineering*
- *Mechanical and aerospace engineering*
- *Metallurgy and materials science*
- *Polymer science*
- *Systems and control engineering*

## **Participating schools**

Goshen College has agreements with

- *Case Western Reserve University (Case School of Engineering)*
- *University of Illinois, Urbana-Champaign*
- *Washington University, St. Louis*

Two of these are private and one is a state school. They have been chosen to provide excellent choices and variety for the Goshen engineering student. Each of the schools has a high reputation as an accredited engineering school.

A school outside this group may be chosen. Goshen College will aid in the transfer.

## **Faculty interaction**

The faculty of the physics department all hold earned doctorates, all have international experience, some of it in research laboratories (Germany and Japan) and some as leaders of the Goshen SST program (Ivory Coast, Germany, Cuba) and each is committed to education as well as to the profession.

Upper-level physics classes, which are taken by engineering students, typically have 10-15 students. This provides close classroom interaction with professors. No classes are taught by assistants.

Each professor leads a research group in which students become involved in investigations of fundamental problems as responsible members of a team. These include Holographic interferometric studies of musical instruments, the biophysics of nerves and synaptic junctions, and X-ray diffraction studies of superlattices and thin metallic films.

As an engineering student you will be encouraged to become part of a faculty-led research group. This is preparation for your eventual senior project at the engineering school.

### **The facilities**

Goshen College offers modern classroom and laboratory facilities to match the program. As an engineering student you will find that includes access to one of the most sophisticated symbolic algebra and computational packages available, as well as the standard packages and network access you should expect.

Our instructional laboratories have twice received National Science Foundation support based on the concepts and ideas of the program.

In 2005 Goshen College received special apparatus for plasma physics experiments, which was specifically designed and constructed at the Princeton Plasma Physics Laboratory of Princeton University. This was provided to Goshen College as part of a Department of Energy program.

Goshen College's undergraduate research program has specialty instruments and laboratories appropriate to the research. The facilities for the optical holography work are the result of NSF support since 2000. The biophysics effort is in one of the most critical areas of investigation at this time: synaptic transmission. The X-ray instruments are specially constructed.

In the physics reading room you will find a growing collection of selected books ranging from the technical to philosophy, history and theology. Often the reading room is the first stop in looking for information you may need. It is also a gathering place for discussions.

### **Maple Scholars**

Maple Scholars is a summer research program with directorship based in the physics department. The scholar receives a stipend and room for eight weeks. The days are spent working with an individual professor on research. All physics faculty are involved.

This summer experience often begins a student's research work. This may result in papers given at national meetings and can culminate in an honors thesis.

### **Typical plan of study**

A typical study plan for the first three years at Goshen College is shown here

#### **First year**

Semester I	hrs	Semester II	hrs	May term
General Physics I	4	General Physics II	4	
Calculus I	4	Calculus II	4	Calculus III
Research Seminar	1	Research Seminar	1	
Lit & Writing Colloquium	4	Programming Tech	3	
Wellness	1	Bibl 100 or 200	3	
	14		15	

#### **Second year**

Semester I	hrs	Semester II	hrs	May term
Thermodynamics	4	Quantum Mechanics	3	
Differential Equations	3	Language II	4	
History or Language I	4	General Chemistry II	4	SST
General Chemistry I	4	Oral Communication	3	
		Research Project	1	
	15		15	

#### **Third year**

Semester I	hrs	Semester II	hrs	May Term
Methods Math Physics	3	Analytical Mechanics	3	
Electronics	4	Optics & Holography	4	
Social Science	3	PJCS/Philosophy	3	Classical Field Theory
Bible/Rel/Phil	3	Humanities	4	
Oral Communication	2	Research Project	1	
	15		15	

### **Faculty**

**John Ross Buschert**, professor, chair; B.A., Goshen College, 1981; M.S., 1985, Ph.D., 1989, Purdue University.

**Carl S. Helrich**, professor; B.S., Case Institute of Technology, 1963; Ph.D., Northwestern University, 1969.

**Paul Meyer Reimer**, associate professor; B.A., Goshen College, 1984; M.S., Purdue University, 1985; Ph.D., University of Illinois at Urbana-Champaign, 1993.