Related O*NET Occupations

EDUCATION ADMINISTRATORS, ALL OTHER (11-9039.99)–**Preparation:** Work experience plus degree. **Description:** All education administrators not listed separately.

EDUCATION ADMINISTRATORS, ELEMENTARY AND SECONDARY SCHOOL (11-9032.00)–**Preparation:** Work experience plus degree. **Description:** Plan, direct, or coordinate the academic, clerical, or auxiliary activities of public or private elementary or secondary-level schools.

EDUCATION ADMINISTRATORS, POSTSECONDARY (11-9033.00)–**Preparation:** Work experience plus degree. **Description:** Plan, direct, or coordinate research, instructional, student administration and services, and other educational activities at postsecondary institutions, including universities, colleges, and junior and community colleges.

EDUCATION ADMINISTRATORS, PRESCHOOL AND CHILD CARE CENTER/PROGRAM (11-9031.00)–**Preparation:** Work experience plus degree. **Description:** Plan, direct, or coordinate the academic and nonacademic activities of preschool and child care centers or programs.

Related DOT Occupations

ACADEMIC DEAN: Develops academic policies and programs for college or university. **ALUMNI SECRETARY:** Directs and coordinates activities of college or university alumni organization. **ASSISTANT PRINCIPAL:** Administers school student personnel program in primary or secondary school and counsels and disciplines students. **BUSINESS MANAGER, COLLEGE OR UNIVERSITY:** Administers business affairs of college or university. **DEAN OF STUDENTS:** Directs and coordinates student programs of college or university. **DEPARTMENT HEAD, COLLEGE OR UNIVERSITY:** Administers affairs of college department, such as English, biological sciences, or mathematics department. **DIRECTOR OF ADMISSIONS:** Directs and coordinates admissions program of public or private college or university according to policies developed by governing board. **DIRECTOR OF INSTITUTIONAL RESEARCH:** Directs and coordinates activities concerned with research and evaluation of operations and programs of college or university. **DIRECTOR OF PUPIL PERSONNEL PROGRAM:** Directs pupil information data system program in support of educational services in accordance with governmental laws and regulations for school district. **DIRECTOR OF STUDENT AFFAIRS:** Plans and arranges social, cultural, and recreational activities of various student groups according to university policies and regulations. **DIRECTOR, ATHLETIC:** Plans, administers, and directs intercollegiate athletic activities in college or university. **DIRECTOR, COMMISSION FOR THE BLIND:** Directs activities of State Commission for the Blind to facilitate vocational and social adjustment of visually handicapped individuals. **DIRECTOR, DAY CARE CENTER:** Directs activities of preschool, day care center, or other child development facility to provide instruction and care for children. **DIRECTOR, EDUCATION:** Plans, develops, and administers educational program of museum, zoo, or similar institution. **DIRECTOR, EDUCATIONAL PROGRAM:** Plans, develops, and administers programs to provide educational opportunities for students. **DIRECTOR, EDUCATIONAL, COMMUNITY-HEALTH NURSING:** Plans and directs educational program for community health agency. **DIRECTOR, EXTENSION WORK:** Directs college or university extension service to provide educational programs for adults in extended day, evening, and off-campus classes and in special interest seminar and convention courses. **DIRECTOR, SCHOOL OF NURSING:** Directs and administers educational program in school of nursing. **DIRECTOR, SPECIAL EDUCATION:** Directs and coordinates special education programs in public school systems, public agencies, and state institutions to teach students with mental or physical disabilities. **DIRECTOR, SUMMER SESSIONS:** Coordinates and directs summer session program of college or university. **DIRECTOR, VOCATIONAL TRAINING:** Directs and coordinates vocational training programs for public school system according to board of education policies and state education code. **EDUCATION SUPERVISOR, CORRECTIONAL INSTITUTION:** Plans and administers program of correlated academic, vocational, and social education in federal, state, or local correctional institution. **FINANCIAL-AID OFFICER:** Directs scholarship, grant-in-aid, and loan programs to provide financial assistance to students in college or university. **PRINCIPAL:** Directs and coordinates educational, administrative, and counseling activities of primary or secondary school. **REGISTRAR, COLLEGE OR UNIVERSITY:** Directs and coordinates college or university registration activities.

Engineering and Natural Sciences Managers

O*NET: 11-9041.00 and 11-9121.00; **GOE Interest Area:** 15 Scientific Research, Engineering, and Mathematics; GOE Work Group: 15.01 Managerial Work in Scientific Research, Engineering, and Mathematics; **Personality Types:** Enterprising; Investigative

Significant Points

- ▲ Most engineering and natural sciences managers have formal education and work experience as engineers, scientists, or mathematicians.
- ▲ Projected employment growth for engineering and natural sciences managers is closely related to growth in employment of the engineers and scientists they supervise and the industries in which they work.
- ▲ Opportunities will be best for workers with strong communication and business management skills.

Nature of the Work

Engineering and natural sciences managers plan, coordinate, and direct research, design, and production activities. They may supervise engineers, scientists, and technicians, along with support personnel. These managers use their knowledge of engineering and natural sciences to oversee a variety of activities. They determine scientific and technical goals within broad outlines provided by top executives, who are discussed elsewhere in the *Handbook*. These goals may include improving manufacturing processes, advancing scientific research, or developing new products. Managers make detailed plans to accomplish these goals. For example, they may develop the overall concepts of a new product or identify technical problems preventing the completion of a project.

To perform effectively, these managers also must apply knowledge of administrative procedures, such as budgeting, hiring, and supervision. They propose budgets for projects and programs and determine staff, training, and equipment needs. They hire and assign scientists, engineers, and support personnel to carry out specific parts of each project. They also supervise the work of these employees, check the technical accuracy of their work and the soundness of their methods, review their output, and establish administrative procedures and policies–including environmental standards, for example.

In addition, these managers use communication skills extensively. They spend a great deal of time coordinating the activities of their unit with those of other units or organizations. They confer with higher levels of

management; with financial, production, marketing, and other managers; and with contractors and equipment and materials suppliers.

Engineering managers may supervise people who design and develop machinery, products, systems, and processes. They might also direct and coordinate production, operations, quality assurance, testing, or maintenance in industrial plants. Many are plant engineers, who direct and coordinate the design, installation, operation, and maintenance of equipment and machinery in industrial plants. Others manage research and development teams that produce new products and processes or improve existing ones.

Natural sciences managers oversee the work of life and physical scientists, including agricultural scientists, chemists, biologists, geologists, medical scientists, and physicists. These managers direct research and development projects and coordinate activities such as testing, quality control, and production. They may work on basic research projects or on commercial activities. Science managers sometimes conduct their own research in addition to managing the work of others.

Work environment. Engineering and natural sciences managers spend most of their time in an office. Some managers, however, also may work in laboratories, where they may be exposed to the same conditions as research scientists, or in industrial plants, where they may be exposed to the same conditions as production workers. Most managers work at least 40 hours a week and may work much longer on occasion to meet project deadlines. Some may experience considerable pressure to meet technical or scientific goals on a short deadline or within a tight budget.

Training, Other Qualifications, and Advancement

Strong technical knowledge is essential for engineering and natural sciences managers, who must understand and guide the work of their subordinates and explain the work in nontechnical terms to senior management and potential customers. Therefore, most managers have formal education and work experience as an engineer, scientist, or mathematician.

Education and training. These managers usually have education similar to that of the workers they supervise. Most engineering managers, for example, begin their careers as engineers after completing a bachelor's degree in the field. Many engineers gain business management skills by completing a master's degree in engineering management (MEM) or business administration (MBA). Employers often pay for such training. In large firms, some courses required in these degree programs may be offered onsite. Typically, engineers who prefer to manage in technical areas pursue an MEM, and those interested in less technical management earn an MBA.

Similarly, many science managers begin their careers as scientists, such as chemists, biologists, geologists, or mathematicians. Most scientists and mathematicians engaged in basic research have a Ph.D. degree; some who work in applied research and other activities may have a bachelor's or master's degree. Graduate programs allow scientists to augment their undergraduate training with instruction in other fields, such as management or computer technology. Natural science managers interested in more technical management may earn traditional master's or Ph.D. degrees in natural sciences or master's degrees in science that incorporate business management skills. Those interested in more general management may pursue an MBA. Given the rapid pace of scientific developments, science managers must continuously upgrade their knowledge.

Other qualifications. Engineering and natural sciences managers must be specialists in the work they supervise. To advance to these positions, engineers and scientists generally must gain experience and assume management responsibility. To fill management positions, employers seek engineers and scientists who possess administrative and communication skills in addition to technical knowledge in their specialty. In fact, because engineering and natural sciences managers must effectively lead groups and coordinate projects, they usually need excellent communication and administrative skills.

Advancement. Engineering and natural sciences managers may advance to progressively higher leadership positions within their disciplines. Some may become managers in nontechnical areas such as marketing, human resources, or sales. In high-technology firms, managers in nontechnical areas often must possess the same specialized knowledge as do managers in technical areas. For example, employers in an engineering firm may prefer to hire experienced engineers as sales workers because the complex services offered by the firm can be marketed only by someone with specialized engineering knowledge. Such sales workers could eventually advance to jobs as sales managers.

Employment

Engineering and natural sciences managers held about 228,000 jobs in 2006. Manufacturing industries employed 38 percent of engineering and natural sciences managers. Manufacturing industries with the largest employment are those that produce computer and electronic equipment and those that produce transportation equipment, including aerospace products and parts. Another 31 percent worked in professional, scientific, and technical services industries, primarily for firms providing architectural, engineering, and related services and firms providing scientific research and development services. Other large employers include federal, state, and local government agencies.

Job Outlook

Employment of engineering and natural sciences managers is projected to grow about as fast as the average for all occupations, similar to the growth rate of engineers and life and physical scientists. Opportunities will be best for workers with strong communication and business management skills.

Employment change. Employment of engineering and natural sciences managers is expected to grow 8 percent over the 2006–2016 decade, about as fast as the average for all occupations. Projected employment growth for engineering and natural sciences managers should be in line with the growth of the engineers and scientists they supervise and the industries in which they work. Because many employers find it more efficient to contract engineering and science work to specialty firms, there should be strong demand for engineering managers in the scientific research and development services industry and for both engineering and

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-16	
				Number	Percent
Engineering and natural sciences managers	—	228,000	246,000	18,000	8
Engineering managers	11-9041	187,000	201,000	14,000	7
Natural sciences managers	11-9121	41,000	45,000	4,600	11

NOTE: Data in this table are rounded.

natural science managers in the architectural, engineering, and related services industry.

Job prospects. Opportunities for engineering managers should be better in rapidly growing areas of engineering, such as environmental and biomedical engineering, than in more slowly growing areas, such as electronics and materials engineering. Opportunities for natural sciences managers should likewise be best in the rapidly growing medical and environmental sciences. (See the statements on engineers and life and physical scientists elsewhere in the *Handbook.*) Engineers and scientists with advanced technical knowledge and strong communication skills will be in the best position to become managers. Because engineering and natural sciences managers are involved in the financial, production, and marketing activities of their firm, business management skills are also advantageous for those seeking management positions. In addition to those openings resulting from employment growth, job openings will result from the need to replace managers who retire or move into other occupations.

Earnings

Earnings for engineering and natural sciences managers vary by specialty and by level of responsibility. Median annual earnings of wage and salary engineering managers were $105,430 in May 2006. The middle 50 percent earned between $84,090 and $130,170. Median annual earnings in the industries employing the largest numbers of engineering managers were

Semiconductor and other electronic component manufacturing	$120,740
Federal executive branch	116,140
Navigational, measuring, electromedical, and control instruments manufacturing	115,150
Aerospace product and parts manufacturing	111,020
Engineering services	103,570

Median annual earnings of wage and salary natural sciences managers were $100,080 in May 2006. The middle 50 percent earned between $77,320 and $130,900. Median annual earnings in the industries employing the largest numbers of natural sciences managers were

Research and development in the physical, engineering, and life sciences	$120,780
Pharmaceutical and medicine manufacturing	111,070
Federal executive branch	96,100
Architectural, engineering, and related services	88,990
State government	65,570

In addition, engineering and natural sciences managers, especially those at higher levels, often receive more benefits–such as expense accounts, stock option plans, and bonuses–than do nonmanagerial workers in their organizations.

Related Occupations

The work of engineering and natural sciences managers is closely related to that of engineers; mathematicians; and physical and life scientists, including agricultural and food scientists, atmospheric scientists, biological scientists, conservation scientists and foresters, chemists and materials scientists, environmental scientists and hydrologists, geoscientists, medical scientists, and physicists and astronomers. It also is related to the work of other managers, especially top executives.

Sources of Additional Information

For information about a career as an engineering and natural sciences manager, contact the sources of additional information for engineers, life scientists, and physical scientists that are listed at the end of statements on these occupations elsewhere in the *Handbook.*

Additional information on science and engineering master's degrees is available from

- Commission on Professionals in Science and Technology, 1200 New York Ave. NW, Suite 113, Washington, DC 20005. Internet: http://www.sciencemasters.org

To learn more about managing scientists and engineers in research and development, see the *Occupational Outlook Quarterly* article "Careers for scientists–and others–in scientific research and development," online at http://www.bls.gov/opub/ooq/2005/summer/art04.htm and in print at many libraries and career centers.

Related O*NET Occupations

ENGINEERING MANAGERS (11-9041.00)–**Preparation:** Work experience plus degree. **Description:** Plan, direct, or coordinate activities in such fields as architecture and engineering or research and development in these fields.

NATURAL SCIENCES MANAGERS (11-9121.00)–**Preparation:** Work experience plus degree. **Description:** Plan, direct, or coordinate activities in such fields as life sciences, physical sciences, mathematics, statistics, and research and development in these fields.

Related DOT Occupations

CHEMICAL LABORATORY CHIEF: Plans and directs activities of chemical laboratory in industrial, research, governmental, or other organization. **CHIEF ENGINEER, WATERWORKS:** Plans and directs activities concerned with water utility systems installation, operation, maintenance, and service. **CHIEF PETROLEUM ENGINEER:** Plans and directs engineering activities of a petroleum company to develop oil fields and produce oil and gas. **ENGINEER-IN-CHARGE, TRANSMITTER:** Directs and coordinates operation and maintenance activities of radio, television broadcasting, or satellite uplink transmitter station in accordance with rules and regulations of Federal Communications Commission. **ENGINEERING MANAGER, ELECTRONICS:** Directs and coordinates activities of engineering department to design, manufacture, and test electronic components, products, and systems. **HIGHWAY-ADMINISTRATIVE ENGINEER:** Administers statewide highway planning, design, construction, and maintenance programs. **MANAGER, LAND SURVEYING:** Plans, directs, and coordinates work of survey parties and related staff engaged in surveying the earth's surface and preparing reports and legal descriptions of land. **PLANT ENGINEER:** Plans, directs, and coordinates activities concerned with design, construction, modification, and maintenance of equipment and machinery in industrial plant. **PROJECT ENGINEER:** Directs, coordinates, and exercises functional authority for planning, organization, control, integration, and completion of engineering project within area of assigned responsibility. **PROJECT MANAGER, ENVIRONMENTAL RESEARCH:** Plans, directs, and coordinates activities of staff involved in developing procedures, equipment, and techniques to solve pollution problems, using scientific research methods. **RESEARCH-CONTRACTS SUPERVISOR:** Directs activities of workers engaged in negotiating and servicing research contracts with universities and other institutions conducting research projects for federal agencies. Evaluates contract proposals and directs awarding of contracts. **SUPERINTENDENT, OIL-WELL SERVICES:** Directs activities concerned with providing technical services, such as electrical well logging; gun perforating; directional or caliper surveying; and cementing, acidizing, and formation fracturing. **TECHNICAL DIRECTOR, CHEMICAL PLANT:** Plans and coordinates technical activities in chemical plant, pilot-plant, or chemical-engineering department.