



International Labour Organization
Organisation internationale du Travail
Organización Internacional del Trabajo

*Updating the
International Standard Classification of Occupations (ISCO)*

*Draft ISCO-08 Group Definitions:
Occupations in Science and Engineering*

DEPARTMENT OF STATISTICS

ISCO 08 Code

211

Title EN

Physical and earth science professionals

Lead Statement

Physical and earth science professionals conduct research, improve or develop concepts, theories and operational methods, or apply scientific knowledge relating to physics, astronomy, meteorology, chemistry, geology and geophysics.

Task statement

Tasks performed usually include: enlarging scientific knowledge through research and experiments related to mechanics, thermodynamics, optics, sonics, electricity, magnetism, electronics, nuclear physics, astronomy, various branches of chemistry, atmospheric conditions and the physical nature of the Earth; and advising on or applying this knowledge in such fields as manufacturing, agriculture, medicine, navigation, space exploration, oil, gas, water and mineral exploitation, telecommunications and other services, or civil engineering; preparing scientific papers and reports.

Included occupations

Excluded occupations

Notes

ISCO 88 Code(s)

211

ISCO 08 Code**2111****Title EN****Physicists and astronomers****Lead Statement**

Physicists and astronomers conduct research, improve or develop concepts, theories and operational methods concerning matter, space, time, energy, forces and fields and the interrelationship between these physical phenomena. They apply scientific knowledge relating to physics and astronomy in industrial, medical, military or other fields.

Task statement

Tasks include:

- (a) conducting research and improving or developing concepts, theories, instrumentation, software and operational methods related to physics and astronomy;
- (b) conducting experiments, tests and analyses on the structure and properties of matter in fields such as mechanics, thermodynamics, electronics, communications, power generation and distribution, aerodynamics, optics and lasers, remote sensing, medicine, sonics, magnetism, and nuclear physics;
- (c) evaluating results of investigations and experiments and expressing conclusions, mainly using mathematical techniques and models;
- (d) applying principles, techniques and processes to develop or improve industrial, medical, military and other practical applications of the principles and techniques of physics or astronomy;
- (e) ensuring the safe and effective delivery of radiation to patients to achieve a diagnostic or therapeutic result as prescribed by a medical practitioner;
- (f) ensuring, accurate measurement and characterization of doses of radiation delivered to patients in medical applications of nuclear technology;
- (g) testing, commissioning and evaluating equipment used in applications such as imaging, medical treatment and dosimetry;
- (h) advising and consulting with medical practitioners and other health care professionals in optimizing the balance between the beneficial and deleterious effects of radiation;
- (i) observing, analysing and interpreting celestial phenomena and developing methods, numerical models and techniques to extend knowledge of fields such as navigation, satellite communication, space exploration, celestial bodies and cosmic radiation;
- (j) maintaining and developing standards and protocols for measurement of physical phenomena and for the use of nuclear technology in industrial and medical applications;
- (k) preparing scientific papers and reports.

Included occupations

Examples of the occupations classified here:

- Astronomer
- Health Physicist
- Medical Physicist
- Nuclear Physicist
- Physicist

Excluded occupations

- Nuclear medicine specialist - 2212
- Radiation Oncologist - 2212
- Radiologist - 2212
- Radiographer – 3211

Notes**ISCO 88 Code(s)**

2111

ISCO 08 Code
2112
Title EN
Meteorologists

Lead Statement

Meteorologists prepare short-term or long-term weather forecasts used in aviation, shipping, agriculture and other areas and for the information of the general public. They conduct research related to the composition, structure and dynamics of the atmosphere.

Task statement

Tasks include:

- (a) investigating direction and speed of air movements, pressures, temperatures, humidity, physical and chemical transformation of pollutants and other phenomena such as cloud formation and precipitation, electrical disturbances or solar radiation;
- (b) studying data collected from meteorological stations, radar and satellite imagery and computer model output to plot and forecast weather conditions;
- (c) preparing and reporting short-term or long-term weather maps, forecasts and warnings relating to atmospheric phenomena such as cyclones, storms and other hazards to life and property and disseminating information about atmospheric conditions through a variety of media including radio, television, print and the Internet;
- (d) conducting experiments in fog dispersal, cloud seeding, rain enhancement and other types of weather modification programs;
- (e) developing and testing mathematical computer models of weather and climate for experimental or operational use;
- (f) participating in studies of the effect of weather on the environment;
- (g) analyzing the impact of industrial projects and human activity on the climate and quality of the air and work with the social science, engineering and economic communities to develop appropriate mitigation strategies;
- (h) engaging in the design and development of new equipment and procedures for meteorological data collection, remote sensing, or for related applications;
- (i) conducting research on and improving or developing concepts, theories and operational methods related to the composition, structure and dynamics of the atmosphere and preparing scientific papers and reports on the outcome of this research;
- (j) preparing scientific papers and reports.

Included occupations

Examples of the occupations classified here:

- Climatologist
- Hydrometeorologist
- Meteorologist
- Weather forecaster

Excluded occupations

Notes

ISCO 88 Code(s)
2112

ISCO 08 Code
2113
Title EN
Chemists

Lead Statement

Chemists conduct research, improve or develop concepts, theories and operational methods, or apply scientific knowledge relating to chemistry, to develop new knowledge or products and for quality and process control.

Task statement

Tasks include:
conducting research and improving or developing concepts, instruments, theories and operational methods related to chemistry;

- (a) conducting experiments, tests and analyses to investigate chemical composition and energy and chemical changes in various natural or synthetic substances, materials and products;
- (b) developing procedures for environmental control, quality control and various other procedures for manufacturers or users;
- (c) conducting programs of sample and data collection and analysis to identify and quantify environmental toxicants;
- (d) participating in interdisciplinary research and development projects working with chemical engineers, biologists, microbiologists, agronomists, geologists or other professionals;
- (e) using micro-organisms to convert substances into new compounds;
- (f) determining ways to strengthen or combine materials or develop new materials.
- (g) reproducing and synthesizing naturally occurring substances and creating new artificial substances;
- (h) preparing scientific papers and reports.

Included occupations

Examples of the occupations classified here:
- Chemist

Excluded occupations

Some related occupations classified elsewhere:
- Biochemist - 2131
- Pharmacologist - 2131
- Pharmacist - 2262

Notes

ISCO 88 Code(s)
2113

ISCO 08 Code**2114****Title EN****Geologists and geophysicists****Lead Statement**

Geologists and geophysicists conduct research; improve or develop concepts, theories and operational methods, or apply scientific knowledge relating to geology and geophysics in such fields as oil, gas and mineral exploration and extraction, water conservation, civil engineering, telecommunications and navigation, and assessment and mitigation of the effects of development and waste disposal projects on the environment.

Task statement

Tasks include:

- (a) conducting research and improving or developing concepts, theories and operational methods related to geology and geophysics;
- (b) studying composition and structure of the Earth's crust, examining rocks, minerals, fossils and other materials, to determine processes affecting the development of the Earth, trace evolution of past life, establish nature and chronology of geological formations and assess their commercial applications;
- (c) interpreting research data and preparing geological reports, maps, charts and diagrams, reports and papers;
- (d) applying geological knowledge to problems encountered in civil engineering projects such as the construction of dams, bridges, tunnels, and large buildings; and land reclamation projects;
- (e) using various remote sensing programs to investigate and measure seismic, gravitational, electrical, thermal, and magnetic forces affecting the Earth;
- (f) estimating weight, size and mass of the Earth and composition and structure of its interior, and studying the nature, activity and predictability of volcanoes, glaciers and earthquakes;
- (g) charting the Earth's magnetic field and applying this and other collected data for broadcasting, navigation and other purposes;
- (h) studying and measuring physical properties of seas and the atmosphere and their inter-relationship, such as the exchange of thermal energy;
- (i) locating and determining the nature and extent of oil, gas and mineral deposits using seismological, gravimetric, magnetic, electrical or radiometric methods;
- (j) identifying deposits of construction materials and determining their characteristics and suitability for use as concrete aggregates, road fill or for other applications;
- (k) researching the movement, distribution and physical properties of ground and surface waters;
- (l) advising in areas such as waste management, route and site selection and the restoration of contaminated sites.

Included occupations

Examples of the occupations classified here:

- Geological oceanographer
- Geologist
- Geophysical oceanographer
- Geophysicist

Excluded occupations**Notes**

ISCO 08 Code**214****Title EN****Engineering professionals (excluding electrotechnology)****Lead Statement**

Engineering professionals (excluding electrotechnology) design, plan and organize the testing, construction, installation and maintenance of structures, machines and their components, and production systems and plants, and plan production schedules and work procedures to ensure engineering projects are undertaken safely, efficiently and in a cost effective manner.

Task statement

Tasks performed usually include: planning and designing chemical process systems, civil engineering projects, mechanical equipment and systems, mining and drilling operations, and other engineering projects; specifying and interpreting drawings and plans, and determining construction methods; supervising the construction of structures, water and gas supply and transportation systems, and the manufacture, installation, operation and maintenance of equipment, machines and plant; organising and managing project labour and the delivery of materials, plant and equipment; estimating total costs and preparing detailed cost plans and estimates as tools for budgetary control; resolving design and operational problems in the various fields of engineering through the application of engineering technology.

Included occupations**Excluded occupations****Notes****ISCO 88 Code(s)**

ISCO 08 Code**2141****Title EN****Industrial and production engineers****Lead Statement**

Industrial and production engineers conduct research and design, organize and oversee the construction, operation and maintenance of process plant and installations. They establish programs for the coordination of manufacturing activities; and assess cost effectiveness and safety.

Task statement

Tasks include:

- (a) studying functional statements, organizational charts and project information to determine functions and responsibilities of workers and work units and to identify areas of duplication;
- (b) establishing work measurement programs and analysing work samples to develop standards for labour utilization;
- (c) analysing workforce utilization, facility layout, operational data and production schedules and costs to determine optimum worker and equipment efficiencies;
- (d) developing specifications for manufacture, and determining materials, equipment, piping, material flows, capacities and layout of plant and systems;
- (e) organising and managing project labour and the delivery of materials, plant and equipment;
- (f) establishing standards and policies for installation, modification, quality control, testing, inspection and maintenance according to engineering principles and safety regulations;
- (g) inspecting plant to improve and maintain performance;
- (h) directing the maintenance of plant buildings and equipment, and coordinating the requirements for new designs, surveys and maintenance schedules;
- (i) advising management on new production methods, techniques and equipment;
- (j) liaising with materials buying, storing and controlling departments to ensure a steady flow of supplies.

Included occupations

Examples of the occupations classified here:

- Industrial efficiency engineer
- Industrial engineer
- Plant engineer
- Production engineer

Excluded occupations

- Manufacturing production manager - 1321

Notes**ISCO 88 Code(s)**

2149, part

ISCO 08 Code
2142
Title EN
Civil engineers

Lead Statement

Civil engineers conduct research, advise on, design, and direct construction; manage the operation and maintenance of civil engineering structures; or study and advise on technological aspects of particular materials.

Task statement

Tasks include:

- (a) conducting research and developing new or improved theories and methods related to civil engineering;
- (b) advising on and designing structures such as bridges, dams, docks, roads, airports, railways, canals, pipelines, waste-disposal and flood-control systems, and industrial and other large buildings;
- (c) determining and specifying construction methods, materials and quality standards, and directing construction work;
- (d) establishing control systems to ensure efficient functioning of structures as well as safety and environmental protection;
- (e) organising and directing maintenance and repair of existing civil engineering structures;
- (f) analyzing the behaviour of soil and rock when placed under pressure by proposed structures and designing structural foundations;
- (g) analyzing the stability of structures and testing the behaviour and durability of materials used in their construction.

Included occupations

Examples of the occupations classified here:

- Civil engineer
- Civil/aerodrome construction engineer
- Civil/bridge construction engineer
- Civil/building construction engineer
- Civil/highway and street construction engineer
- Geotechnical engineer
- Structural engineer

Excluded occupations

Some related occupations classified elsewhere:

- Civil engineering project manager - 1323
- Geoscientist 2146
- Mining engineers, metallurgists and related professionals 2146
- Town and Traffic Planners 2164

Notes

ISCO 88 Code(s) 2142

ISCO 08 Code**2143****Title EN****Environmental engineers****Lead Statement**

Environmental engineers conduct research, advise on, design and direct implementation of solutions to prevent, control or remedy negative impacts of human activity on the environment utilizing a variety of engineering disciplines. They conduct environmental assessments of construction and civil engineering projects and apply engineering principles to pollution control, recycling and waste disposal.

Task statement

Tasks include:

- (a) conducting research, assessing and reporting on the environmental impact of existing and proposed construction, civil engineering and other activities;
- (b) inspecting industrial and municipal facilities and programs to evaluate operational effectiveness and ensure compliance with environmental regulations;
- (c) designing and overseeing the development of systems, processes and equipment for control, management, or remediation of water, air, or soil quality;
- (d) providing environmental engineering assistance in network analysis, regulatory analysis, and planning or reviewing database development;
- (e) obtaining, updating, and maintaining plans, permits, and standard operating procedures.
- (f) providing engineering and technical support for environmental remediation and litigation projects, including remediation system design and determination of regulatory applicability.
- (g) monitoring progress of environmental improvement programs;
- (h) advising corporations and government agencies of procedures to follow in cleaning up contaminated sites to protect people and the environment;
- (i) collaborating with environmental scientists, planners, hazardous waste technicians, engineers from other disciplines, and specialists in law and business to address environmental problems.

Included occupations

Examples of the occupations classified here:

- Air pollution control engineer,
- Environmental analyst
- Environmental engineer
- Environmental remediation specialist,

Excluded occupations**Notes****ISCO 88 Code(s)**

2149, part

ISCO 08 Code
2144
Title EN
Mechanical engineers

Lead Statement

Mechanical engineers conduct research; advise on, design, and direct production of machines, ships, machinery and industrial plant, equipment and systems, advise on and direct their functioning, maintenance and repair; or study and advise on mechanical aspects of particular materials, products or processes.

Task statement

Tasks include:

- (a) advising on and designing machinery and tools for manufacturing, mining, construction, agricultural, and other industrial purposes;
- (b) advising on and designing steam, internal combustion and other non-electric motors and engines used for propulsion of railway locomotives, road vehicles or aircraft, or for driving industrial or other machinery;
- (c) advising on and designing: hulls, superstructures and propulsion systems of ships; mechanical plant and equipment for the release, control and utilization of energy; heating, ventilation and refrigeration systems, steering gear, pumps, and other mechanical equipment;
- (d) advising on and designing airframes, undercarriages and other equipment for aircraft as well as suspension systems, brakes, vehicle bodies and other components of road vehicles;
- (e) advising on and designing non-electrical parts of apparatus or products such as word processors, computers, precision instruments, cameras and projectors;
- (f) establishing control standards and procedures to ensure efficient functioning and safety of machines, machinery, tools, motors, engines, industrial plant, equipment, or systems;
- (g) ensuring that equipment, operation and maintenance comply with design specifications and safety standards.

Included occupations

Examples of the occupations classified here:

- Aeronautical engineer
- Marine architect
- Marine engineer
- Mechanical engineer

Excluded occupations

Some related occupations classified elsewhere:

- Ship engineer - 3141

Notes

ISCO 88 Code(s)

2145

ISCO 08 Code
2145
Title EN
Chemical engineers

Lead Statement

Chemical engineers conduct research and develop, advise on and direct commercial-scale chemical processes and production of various substances and items such as crude oil, petroleum derivatives, food and drink products, medicines, or synthetic materials. They direct maintenance and repair of chemical plant and equipment and study and advise on chemical aspects of particular materials, products or processes.

Task statement

Tasks include:

- (a) conducting research and advising on, and developing commercial-scale chemical processes to refine crude oil and other liquids or gases, and to produce substances and items such as petroleum derivatives, explosives, food and drink products, medicines, or synthetic materials;
- (b) specifying chemical production methods, materials and quality standards and ensuring that they conform to specifications;
- (c) establishing control standards and procedures to ensure safety and efficiency of chemical production operations and safety of workers operating equipment or working in close proximity to on-going chemical reactions;
- (d) designing chemical plant equipment and devising processes for manufacturing chemicals and products;
- (e) performing tests throughout stages of production to determine degree of control over variables, including temperature, density, specific gravity, and pressure;
- (f) developing safety procedures to be employed;
- (g) preparing estimates of production costs and production progress reports for management;
- (h) performing laboratory studies of steps in manufacture of new products and testing proposed process in small scale operation such as a pilot plant.

Included occupations

Examples of the occupations classified here:

- Chemical engineer
- Fuel technologist
- Plastics technologist
- Refinery process engineer

Excluded occupations

Notes

ISCO 88 Code(s)
2146

ISCO 08 Code**2146****Title EN****Mining engineers, metallurgists and related professionals****Lead Statement**

Mining engineers, metallurgists and related professionals conduct research on and , design and develop and maintain commercial-scale methods of extracting metals from their ores, or minerals, water, oil or gas from the earth and of developing new alloys, ceramic and other materials, or study and advise on mining or metallurgical aspects of particular materials, products or processes.

Task statement

Tasks include:

- (a) determining the location and planning the extraction of coal, metallic ores, non-metallic minerals, and building materials, such as stone and gravel;
- (b) determining most suitable methods of efficient mining and extraction, types of machinery to be used, planning layout and directing construction of shafts and tunnels;
- (c) determining drilling site and devising methods of controlling the flow of water, oil or gas from wells;
- (d) planning and directing storage, initial treatment and transportation of water, oil or gas;
- (e) establishing safety standards and procedures and first-aid facilities, especially underground;
- (f) conducting research, developing methods of extracting metals from their ores and advising on their application;
- (g) investigating properties of metals and alloys, developing new alloys and advising on and supervising technical aspects of metal and alloy manufacture and processing;
- (h) maintaining technical liaison and consultancy with other relevant specialists such as geologists and geophysicists;
- (i) examining deposits or mines to evaluate profitability.

Included occupations

Examples of the occupations classified here:

- Extractive metallurgist,
- Mining engineer
- Mining/coal engineer
- Mining/metal engineer
- Mining/petroleum and natural gas engineer

Excluded occupations

Some related occupations classified elsewhere:

- Geologists - 2114
- Geophysicists - 2114

Notes**ISCO 88 Code(s)****2147**

ISCO 08 Code**2149****Title EN****Engineering professionals not elsewhere classified****Lead Statement**

This unit group covers architects, engineers and related professionals not classified elsewhere in Minor group 214, *Engineering Professionals (excluding electrotechnology)* and 215, *Electrotechnology engineers*. This group includes, for instance, those who conduct research, advise on or develop engineering procedures and solutions concerning workplace safety, biomedical engineering; optics; materials; nuclear power generation and explosives.

Task statement

In such cases tasks would include:

- (a) applying knowledge of engineering to the design, development, and evaluation of biological and health systems and products, such as artificial organs, prostheses, and instrumentation;
- (b) designing devices used in various medical procedures, imaging systems such as magnetic resonance imaging (MRI), and devices for automating insulin injections or controlling body functions;
- (c) designing components of optical instruments such as lenses, microscopes, telescopes, lasers, optical disc systems and other equipment that utilize the properties of light;
- (d) designing, testing, and coordinating the development of explosive ordnance material to meet military procurement specifications;
- (e) designing and overseeing construction and operation of nuclear reactors and power plants and nuclear fuels reprocessing and reclamation systems;
- (f) designing and developing nuclear equipment such as reactor cores, radiation shielding, and associated instrumentation and control mechanisms;
- (g) assessing damage and providing calculations for marine salvage operations;
- (h) studying and advising on engineering aspects of particular manufacturing processes, such as those related to glass, ceramics, textiles, leather products, wood, and printing;
- (i) identifying potential hazards and introducing safety procedures and devices.

Included occupations

Examples of the occupations classified here:

- Biomedical engineer
- Explosive ordnance engineer
- Marine salvage engineer
- Materials engineer
- Optical engineer
- Safety engineer

Excluded occupations

Some related occupations classified elsewhere:

- Industrial and production engineer - 2141
- Environmental engineer - 2143
- Surveyor - 2165

Notes**ISCO 88 Code(s)**

2149, part

ISCO 08 Code**215****Title EN****Electrotechnology engineers****Lead Statement**

Electrotechnology engineers conduct research on and design, advise, plan and direct the construction and operation of electronic, electrical and telecommunications systems, components, motors, and equipment. They organize and establish control systems to monitor the performance and safety of electrical and electronic assemblies and systems.

Task statement

Tasks performed usually include: conducting research, advising on and directing the maintenance and repair of electrical, electronic and telecommunications products and systems; advising on and designing power stations and systems that generate, transmit and distribute electrical power; establishing control standards to monitor performance and safety of electrical, electronic and telecommunication systems and equipment.

Included occupations**Excluded occupations****Notes****ISCO 88 Code(s)**

ISCO 08 Code
2151
Title EN
Electrical engineers

Lead Statement

Electrical engineers conduct research and advise on, design, and direct the construction and operation of electrical systems, components, motors and equipment, and advise on and direct their functioning, maintenance and repair, or study and advise on technological aspects of electrical engineering materials, products and processes.

Task statement

Tasks include -

- (a) advising on and designing power stations and systems which generate , transmit and distribute electrical power;
- (b) supervising, controlling and monitoring the operation of electrical generation, transmission and distribution systems;
- (c) advising on and designing systems for electrical motors, electrical traction and other equipment, or electrical domestic appliances;
- (d) specifying electrical installation and application in industrial and other buildings and objects;
- (e) establishing control standards and procedures to monitor performance and safety of electrical generating and distribution systems, motors and equipment;
- (f) determining manufacturing methods for electrical systems, as well as maintenance and repair of existing electrical systems, motors and equipment.

Included occupations

Examples of the occupations classified here

- Electric power generation engineer
- Electrical engineer
- Electromechanical engineer

Excluded occupations

Examples of the occupations classified here:

- Nuclear power generation engineer - 2149
- Electronics engineer 2152
- Telecommunications Engineer 2151
- Broadcast Engineer 2151

Notes

ISCO 88 Code(s)
2143

ISCO 08 Code
2152
Title EN
Electronics engineers

Lead Statement

Electronics engineers conduct research on, design, and direct the construction functioning, maintenance and repair of electronic systems and study and advise on technological aspects of electronic engineering materials, products or processes.

Task statement

Tasks include -

- (a) advising on and designing electronic devices or components, circuits, semi-conductors, and systems;
- (b) specifying production or installation methods, materials and quality standards and directing production or installation work of electronic products and systems;
- (c) establishing control standards and procedures to ensure efficient functioning and safety of electronic systems, motors and equipment;
- (d) organising and directing maintenance and repair of existing electronic systems, and equipment;
- (e) designing electronic circuits and components for use in fields such as aerospace guidance and propulsion control, acoustics, or instruments and controls;
- (f) researching and advising on radar, telemetry and remote control systems, microwaves and other electronic equipment;
- (g) designing and developing signal processing algorithms and implementing these through appropriate choice of hardware and software;
- (h) developing apparatus and procedures to test electronic components, circuits and systems.

Included occupations

Examples of the occupations classified here:

- Computer hardware engineer
- Electronics engineer
- Instrumentation engineer

Excluded occupations

Telecommunications Engineer

Notes

ISCO 88 Code(s)

2144, part

ISCO 08 Code
2153
Title EN
Telecommunications engineers

Lead Statement

Lead Statement

Telecommunications engineers conduct research and advise on, design, and direct the construction of the functioning, maintenance and repairs of telecommunication systems and equipment. They study and advise on technological aspects of telecommunication engineering materials, products or processes.

Task statement

Tasks include -

- (a) advising on and designing telecommunications devices or components, systems, equipment and distribution centres;
- (b) specifying production or installation methods, materials, quality and safety standards and directing production or installation work of telecommunications products and systems;
- (c) organizing and directing maintenance and repair of existing telecommunication systems, motors and equipment;
- (d) researching and advising on telecommunications equipment;
- (e) planning and designing communications networks based on wired, fibre optical and wireless communication media;
- (f) designing and developing signal processing algorithms and implementing these through appropriate choice of hardware and software;
- (g) designing telecommunications networks and radio and television distribution systems, including both cable and over the air.

Included occupations

Examples of the occupations classified here:

- Broadcast engineer
- Telecommunications engineer
- Telecommunications engineering technologist

Excluded Occupations:

- Electronics engineer 2152

ISCO 08 Code**311****Title EN****Physical and engineering science technicians****Lead Statement**

Physical and engineering science technicians perform technical tasks to aid in research on and the practical application of concepts, principles and operational methods particular to physical sciences including such areas as engineering, technical drawing or economic efficiency of production processes.

Task statement

Tasks performed usually include: undertaking and carrying out technical work related to chemistry, physics, geology, meteorology, astronomy, engineering, or technical drawing; setting up, operating, and maintaining laboratory instruments and equipment, monitoring experiments, making observations, and calculating and recording results; preparing materials for experimentation; conducting tests of systems: collecting and testing samples; recording observations and analyzing data; preparing, revising and interpreting technical drawings, wiring diagrams, circuit board assembly diagrams, layout drawings. They may receive guidance from *Managers* or *Professionals*. Supervision of other workers may be required.

Included occupations**Excluded occupations****Notes****ISCO 88 Code(s)**

311

ISCO 08 Code**3111****Title EN****Chemical and physical science technicians****Lead Statement**

Chemical and physical science technicians perform technical tasks to aid in research in chemistry, physics, geology, geophysics, meteorology and astronomy, and in the development of industrial, medical, military and other practical applications of research results.

Task statement

Tasks include:

- (a) collecting samples and preparing materials and equipment for experiments, tests and analyses;
- (b) carrying out routine laboratory tests and performing a variety of technical support functions to assist chemical and physical scientists in research, development, analysis and testing;
- (c) controlling the quality and quantity of laboratory supplies by testing samples and monitoring usage and preparing detailed estimates of quantities and costs of materials and labour required for projects, according to the specifications given;
- (d) setting up, operating, and maintaining laboratory instruments and equipment, monitoring experiments, making observations, and calculating and recording results;
- (e) preparing materials for experimentation such as freezing and slicing specimens and mixing chemicals;
- (f) collecting and testing earth and water samples, recording observations and analyzing data in support of geologists or geophysicists.

Included occupations

Examples of the occupations classified here:

- Chemistry technician
- Geology technician
- Meteorology technician
- Physics technician,

Excluded occupations

Some related occupations classified elsewhere:

- Chemical engineering technician 3116
- Life science technician 3141

Notes**ISCO 88 Code(s)****3111**

ISCO 08 Code**3113****Title EN****Electrical engineering technicians****Lead Statement**

Electrical engineering technicians perform technical tasks to aid in electrical engineering research, and in the design, manufacture, assembly, construction, operation, maintenance and repair of electrical equipment, facilities and distribution systems.

Task statement

Tasks include:

- (a) providing technical assistance in research on and development of electrical equipment and facilities, or testing prototypes;
- (b) designing and preparing blueprints of electrical installations and circuitry according to the specifications given;
- (c) preparing detailed estimates of quantities and costs of materials and labour required for manufacture and installation according to the specifications given;
- (d) monitoring technical aspects of the manufacture, installation, utilization, maintenance and repair of electrical systems and equipment to ensure satisfactory performance and compliance with specifications and regulations;
- (e) planning installation methods, checking completed installation for safety and controls or undertaking the initial running of the new electrical equipment or systems;
- (f) assembling, installing, testing, calibrating, modifying and repairing electrical equipment and installations to conform with regulations and safety requirements.

Included occupations

Examples of the occupations classified here:

- Electrical engineering technician
- Electric power transmission engineering technician

Excluded occupations

Some related occupations classified elsewhere:

- Electronics engineering technician -3114
- Power production plant operator – 3131
- Electrical mechanic - 7241

Notes**ISCO 88 Code(s)**

3113, 3152 part

ISCO 08 Code**3114****Title EN****Electronics engineering technicians****Lead Statement**

Electronics engineering technicians perform technical tasks to aid in electronic research, and in the design, manufacture, assembly, construction, operation, maintenance and repair of electronic equipment.

Task statement

Tasks include:

- (a) providing technical assistance in research and development of electronic equipment, or testing prototypes;
- (b) designing and preparing blueprints of electronic circuitry according to the specifications given;
- (c) preparing detailed estimates of quantities and costs of materials and labour required for the manufacture and installation of electronic equipment, according to the specifications given;
- (d) monitoring technical aspects of the manufacture, utilization, maintenance and repair of electronic equipment to ensure satisfactory performance and ensure compliance with specifications and regulations;
- (e) assisting in the design, development, installation, operation and maintenance of electronic systems;
- (f) planning installation methods, checking completed installation for safety and controls or undertaking the initial running of the new electronic equipment or system;
- (g) conducting tests of electronic systems, collecting and analyzing data, and assembling circuitry in support of electronics engineers.

Included occupations

Examples of the occupations classified here:

- Technician, engineering/electronics
- Technician, engineering/telecommunications

Excluded occupations

Some related occupations classified elsewhere:

- Electrical engineering technician - 3113
- Telecommunications engineering technician– 3522
- Electronics mechanic – 7243
- Electronic equipment assembler, - 8283

Notes**ISCO 88 Code(s)**

3114 part, 3152 part

ISCO 08 Code**3115****Title EN****Mechanical engineering technicians****Lead Statement**

Mechanical engineering technicians perform technical tasks to aid in mechanical engineering research, and in the design, manufacture, assembly, construction, operation, maintenance and repair of machines, components and mechanical equipment.

Task statement

Tasks include:

- (a) providing technical assistance in research on and development of machines and mechanical installations, facilities and components, or testing prototypes;
- (b) designing and preparing layouts of machines and mechanical installations, facilities and components according to the specifications given;
- (c) preparing detailed estimates of quantities and costs of materials and labour required for manufacture and installation according to the specifications given;
- (d) monitoring technical aspects of manufacture, utilization, maintenance and repair of machines and mechanical installations, facilities and components to ensure satisfactory performance and compliance with specifications and regulations;
- (e) developing and monitoring the implementation of safety standards and procedures for marine survey work in relation to ships' hulls, equipment and cargoes;
- (f) assembling and installing new and modified mechanical assemblies, components, machine tools and controls, and hydraulic power systems;
- (g) conducting tests of mechanical systems, collecting and analyzing data, and assembling and installing mechanical assemblies in support of mechanical engineers;
- (h) ensuring that mechanical engineering designs and finished work are within specifications, regulations and contract provisions.

Included occupations

Examples of the occupations classified here:

- Aeronautics engineering technician
- Marine engineering technician
- Mechanical engineering technician
- Mechanical engineering estimator
- Marine surveyor
- Vehicle inspector

Excluded occupations

Some related occupations classified elsewhere:

- Industrial machinery mechanic, - 7233
- Mechanical machinery assembler, - 8281

Notes**ISCO 88 Code(s)**

3115, 3152 part

ISCO 08 Code**3116****Title EN****Chemical engineering technicians****Lead Statement**

Chemical engineering technicians perform technical tasks to aid in chemical engineering research, and in the design, manufacture, construction, operation, maintenance and repair of chemical plant.

Task statement

Tasks include -

- (a) assisting in research on and development of industrial chemical processes, plant and equipment, or testing prototypes;
- (b) designing and preparing layouts of chemical plants according to the specifications given;
- (c) preparing detailed estimates of quantities and costs of materials and labour required for manufacture and installation according to the specifications given;
- (d) monitoring technical aspects of the construction, installation, operation, maintenance and repair of chemical plants to ensure satisfactory performance and compliance with specifications and regulations;
- (e) conducting chemical and physical laboratory tests to assist scientists and engineers in making qualitative and quantitative analyses of solids, liquids, and gaseous materials.

Included occupations

Examples of the occupations classified here:

- Chemical engineering technician
- Chemical engineering estimator
- Petroleum engineering technician

Excluded occupations

Some related occupations classified elsewhere:

- Chemical technician - 3111

Notes**ISCO 88 Code(s)**

3116, 3152 part

ISCO 08 Code**3117****Title EN****Mining and metallurgical technicians****Lead Statement**

Mining and metallurgical technicians perform technical tasks to assist in research and experiments related to metallurgy, in improving methods of extracting solid minerals, oil and gas, and in the design, construction, operation, maintenance and repair of mines and mine installations, of systems for transporting and storing oil and natural gas, and for extraction of metals from ores.

Task statement

Tasks include:

- (a) providing technical assistance to aid in research on and development of processes to determine the properties of metals and new alloys;
- (b) providing technical assistance in geological and topographical surveys, and in the design and layout of oil, natural gas and mineral ore extraction and transportation systems, and processing and refining plants for minerals and metals;
- (c) preparing detailed estimates of qualities and costs of materials and labour required for mineral, oil and natural gas exploration, extraction and transport projects and plan, and for processing and mineral refining plant according to the specifications given;
- (d) monitoring technical, regulatory and safety aspects of the construction, installation, operation, maintenance and repair of mineral ore, oil and natural gas exploration, extraction, transport and storage installations and mineral processing plants;
- (e) helping plan and design mines, mine shafts, tunnels and underground first-aid facilities;
- (f) collecting and preparing rock, mineral and metal samples, performing laboratory tests to determine properties, analyzing and reporting test results and maintaining testing equipment;
- (g) using microscopes, electromagnetic irradiation machines, spectrometers, spectrographs, densitometers and tension testing machines;
- (h) assisting scientists in the use of electrical, sonic, or nuclear measuring instruments in both laboratory and production activities to obtain data indicating potential sources of metallic ore, gas, or petroleum.

Included occupations

Examples of the occupations classified here:

- Mines inspector
- Mining engineering technician
- Metallurgical technician

Excluded occupations

Some related occupations classified elsewhere:

- Mining plant operator - 8111
- Miner - 8111
- Quarrier - 8111
- Geology technician - 3111

Notes**ISCO 88 Code(s)**

ISCO 08 Code
3118
Title EN
Draughtspersons

Lead Statement

Draughtspersons prepare technical drawings, maps and illustrations from sketches, measurements and other data, and copy final drawings and paintings onto printing plates.

Task statement

Tasks include:

- (a) preparing and revising working drawings from sketches and specifications prepared by engineers and designers for the manufacture, installation and erection of machinery and equipment or for the construction, modification, maintenance and repair of buildings, dams, bridges, roads and other architectural and civil engineering projects;
- (b) operating computer-aided design (CAD) or computer-aided design and drafting (CADD) equipment to create, modify and generate hard-copy and digital representations of working drawings;
- (c) operating digitising table or similar equipment to transfer hard-copy representation of working drawings, maps and other curves to digital form;
- (d) preparing and revising illustrations for reference works, brochures and technical manuals dealing with the assembly, installation, operation, maintenance and repair of machinery and other equipment and goods;
- (e) copying drawings and paintings onto stone or metal plates for printing;
- (f) preparing wiring diagrams, circuit board assembly diagrams, and layout drawings used for manufacture, installation, and repair of electrical equipment in factories, power plants, and buildings;
- (g) creating detailed working diagrams of machinery and mechanical devices, including dimensions, fastening methods, and other engineering information;
- (h) arranging for completed drawings to be reproduced for use as working drawings.

Included occupations

Examples of the occupations classified here:

- Draughtsperson
- Technical illustrator

Excluded occupations

- Cartographers 2165
- Surveyors 2165

Notes

ISCO 88 Code(s)
3118

ISCO 08 Code**3119****Title EN****Physical and engineering science technicians not elsewhere classified****Lead Statement**

This unit group covers physical and engineering science technicians not classified elsewhere in Minor group 311, Physical and engineering science technicians. For instance, those who assist engineers engaged in developing procedures or conducting research on safety, biomedical, environmental or industrial and production engineering should be classified here.

Task statement

In such cases tasks would include:

- (a) collecting data and providing technical assistance regarding;
- (b) efficient, safe and economic utilization of personnel, material and equipment;
- (c) methods of work and sequence of operations and supervision of their implementation;
- (d) efficient layout of plant or establishment;
- (e) aiding in the identification of potential hazards and introducing safety procedures and devices;
- (f) modifying and testing equipment and devices used in the prevention, control, and remediation of environmental pollution, site remediation, and land reclamation;
- (g) assisting in the development of environmental pollution remediation devices under the direction of an engineer;
- (h) assisting engineers in testing and designing robotics equipment.

Included occupations

Examples of the occupations classified here:

- Engineering/industrial efficiency technician
- Engineering/production technician
- Engineering/time and motion study technician
- Quantity surveying technician,
- Robotics technician,
- Forensic Science technicians

Excluded occupations

Some related occupations classified elsewhere:

- Production engineer, - 2149
- Time and motion study engineer - 2149
- Quantity surveyor - 2149
- Engineering/aeronautics technician - 3115

Notes**ISCO 88 Code(s)**

3119