



**CURRICULUM GUIDE
2009-2010**

**MATH AND SCIENCE
CERTIFICATES OF ACCOMPLISHMENT**

**Includes Anthropology: Cultural; Anthropology: Physical; Archaeology; Astronomy;
Biology: General; Biology: Human; Biology: Life Sciences Survey;
Biotechnology: Bio-manufacturing; Chemistry Lab Skills: Advanced;
Chemistry Lab Skills: Basic; Computer Applications in Biotechnology;
Earth and Environmental Sciences; Engineering; Environmental Stewardship;
Geographic Information Systems (GIS); Geography: Cultural; Geography: Physical;
Geology; Mathematics: Applied; Mathematics: Pure; Paleobiology/Natural History;
Physical Science; Physics: Advanced; Physics: Introductory**

Requirements for Certificate of Accomplishment:

- a) Complete satisfactorily the courses listed for the particular certificate.
- b) Complete at least 50% of the required units at Ohlone College.
- c) Maintain a 2.0 grade point average.

ANTHROPOLOGY: CULTURAL

The Cultural Anthropology Certificate is awarded to students who have completed courses that trace the historic and prehistoric development and change in various cultures. Upon completion of the certificate requirements students will have completed a comprehensive spectrum of topics including development of language, traditions, belief systems, and economic and political organizations in various cultures. This certificate gives students an appreciation for diverse cultures and it provides a better understanding of the development of world social and political institutions.

ANTH-101	Physical Anthropology	4
ANTH-102	Cultural Anthropology	3
ANTH-104	Survey of North American Indian Cultures	3
GEOG-102	Cultural Geography	3

Choose one course from the following:

IS-110	Introduction to Ethnic Studies OR	3
IS-120	Women of the Western World	(3)

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ANTHROPOLOGY: PHYSICAL

The Physical Anthropology Certificate is designed to provide students with a basic foundation in the interaction between biology and culture. Upon completion of this certificate students will have completed lecture and laboratory training in paleontology and biology as these relate to the evolution of man. This certificate is well suited to prepare students to pursue further studies in fields that require an appreciation for our evolutionary and cultural past.

ANTH-101	Physical Anthropology	4
ANTH-102	Cultural Anthropology	3
BIOL-105	Heredity, Evolution, and Society	3
BIOL-130	Introduction to Biology	4
GEOL-103	Paleontology and Dinosaurs	<u>3</u>
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ARCHAEOLOGY

The Certificate in Archaeology is designed to provide students with the necessary anthropological archaeology skills to either continue for a four-year degree in archaeology or to obtain entry-level employment in cultural resource management. Students who complete this program will be educated in basic concepts, theories, and methods employed by archaeologists in reconstructing past life ways of humans and to aid in the preservation of culture and history. The courses required for this program will also satisfy the entry prerequisites for the Archaeological Technology Certificate Program at Cabrillo College in Aptos, California.

ANTH-102	Cultural Anthropology	3
ANTH-103	Introduction to Archaeology and Prehistory	3
ANTH-104	Survey of North American Indian Cultures	3
ANTH-105	Field Archaeology	3
CS-101L	Computer Applications	<u>2</u>
		14

Recommended Courses: (Optional)

GEOG-121	Introduction to Geographic Information Systems (GIS)	(2)
GEOG-122	Environmental GIS	(2)
GEOG-123	GIS Projects	(1)

ASTRONOMY

Students completing this certificate have received basic knowledge about the properties of stars and planets as well as insight in the physical principles underlying galaxy, star, and planet formation and evolution. In addition, students will have gained some quantitative understanding of measurement techniques involved in the study of these systems.

This knowledge not only provides the first foundation for continued study in astronomy or in the broad and expanding field of environmental sciences, but it will also facilitate paraprofessional employment in the form of research internships with various city, county, state, and private agencies.

ASTR-101A	General Astronomy of the Solar System	3
ASTR-101B	General Astronomy Beyond the Solar System	3
MATH-181	Trigonometry	<u>3</u>
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BIOLOGY: GENERAL

The certificate in General Biology indicates that students have successfully completed a regimen of introductory science courses including chemistry (inorganic and organic), mathematics or physics, and introductory college biology. Most of these courses are transferable and constitute a part of the freshman/sophomore core courses for the bachelor's degree in biology at four-year institutions. Students gain knowledge and laboratory skills in molecular and cell biology, metabolic processes, microscopy, genetics, DNA technology, microbiology, systematics, plant and animal physiology, and evolution and ecology. This certificate prepares students for a wide range of technical positions in private industry (biotechnology, pharmaceutical and medical supply, agricultural, environmental consulting firms, etc.) or in city, state, or federal agencies. This certificate is also ideal for students planning to pursue advanced studies in biology.

BIOL-101B	Principles of Biology--Organisms and Systems	5
CHEM-112B	Organic Chemistry	5

Choose one of the following courses:

MATH-101A	Calculus with Analytic Geometry OR	5
PHYS-121	Introduction to Physics II OR	(4)
PHYS-142	Optics, Heat, and Modern Physics	(4)

Choose two units in Biology from the following:

BIOL-131D	Review of Biological Concepts	1
BIOL-201	Special Projects	1
BIOL-202	Special Projects	2
BIOT-120	Introduction to Scanning Electron Microscopy (SEM)	<u>1</u>
		16-17

BIOLOGY: HUMAN

The Human Biology Certificate is designed to provide students with a basic foundation on which to build their understanding of human biology. This certificate program is primarily for those students who will pursue careers as allied health professionals (e.g., nursing, respiratory therapy, and physical therapy assistant programs) and fulfills the typical prerequisite requirements for entry into these programs. Some variations in program requirements make it essential that the student refer to the catalog of the program of interest and consult a counselor.

BIOL-103A	Human Anatomy and Physiology	4
BIOL-103B	Human Anatomy and Physiology	4
BIOL-130	Introduction to Biology	4

Choose one course from the following:

BIOL-106	Microbiology OR	5
BIOL-107	Microbiology and Infectious Diseases	(3)
		15-17

BIOLOGY: LIFE SCIENCES SURVEY

This certificate demonstrates that students have received training in biological principles as they relate to evolution, human systems, and the interaction of humans with their natural world. Current techniques and issues in genetics, ecology, and disease are emphasized. This certificate provides the basics for further studies in the life sciences.

Choose one course from the following:

BIOL-130	Introduction to Biology OR	4
BIOT-105	Introduction to Cell and Molecular Biology	(4)

Complete at least three of the following courses:

BIOL-105	Heredity, Evolution, and Society	3
BIOL-107	Microbiology and Infectious Diseases	3
BIOL-108	Human Ecology	3
BIOL-109	Biology of Sexual Reproduction	<u>3</u>
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BIOTECHNOLOGY: BIO-MANUFACTURING

This certificate program provides students with an excellent preparation in various protocols and hands-on laboratory skills used in many biotechnology companies. A goal of the program is to prepare students for entry-level positions in biotech and pharmaceutical companies.

This certificate prepares students as laboratory research assistants and biomanufacturing technicians. It provides excellent preparation in laboratory skills used in entry-level positions at many biotechnology and pharmaceutical companies.

BIOT-105	Introduction to Cell and Molecular Biology	4
BIOT-110A1	Introduction to DNA Techniques	1
BIOT-110A2	PCR I and DNA Sequencing	1
BIOT-110A3	Protein Isolation and Assays	1
BIOT-111A	Genomic and cDNA Library Construction and Analysis	1
BIOT-111B	PCR Primer Design and Optimization and Reverse Transcription	1
BIOT-113	GMP/GLP	1
BIOT-115A	Mammalian Cell Culture Techniques	2
BIOT-121	Biotechnology Careers	1
BIOT-123	Writing SOPs	.5
CHEM-109	Biochemistry for Health Science and Biotechnology	<u>4</u>
		17.5

Optional Courses (recommended)

BIOT-112	Introduction to Bioinformatics	2
BIOT-114	Introduction to Plant Biology	3
BIOT-115B	Bioreactor Cell Culture Techniques	2
BIOT-117	Immunology	1
BIOT-119	Clean Room Operations	.5
BIOT-120	Introduction to Scanning Electron Microscopy	1
BIOT-122	Introduction to Nanotechnology	3
BIOT-131	Computing Concepts in Biotechnology	4
BIOT-132	DNA Computing	1
BIOT-133	Introduction to SAS Programming	3
BIOT-143	Advanced SAS Programming	3
BIOT-203	Biotechnology Internship	3

CHEMISTRY LAB SKILLS: ADVANCED

This certificate in Advanced Chemistry Lab Skills emphasizes basic laboratory skills, plus experience with distillation, refluxing, purification techniques, melting point determinations, and hands-on use of FTIR. Ideal for the students seeking a research internship, this certificate demonstrates advanced skill and the ability to work independently in both organic and inorganic lab settings. Students receiving this certificate would be best qualified for more selective internships or employment in a chemical lab.

CHEM-112A	Organic Chemistry	5
CHEM-112B	Organic Chemistry	<u>5</u>
		10

CHEMISTRY LAB SKILLS: BASIC

This certificate emphasizes basic laboratory skills including titration, pipetting, UV/Vis spectrophotometry, and solution preparation. Advantageous to any student interested in science, this certificate demonstrates a basic mastery of lab protocols in an inorganic lab setting. This certificate is highly recommended for stock room assistants and similar positions.

CHEM-101A	General Chemistry	5
CHEM-101B	General Chemistry	<u>5</u>
		10

COMPUTER APPLICATIONS IN BIOTECHNOLOGY

The field of computer applications in biotechnology is a complex hybrid of two distinct scientific disciplines—computer technology and bioscience. This certificate is designed to provide an understanding of bioinformatics and other computer related subjects to students with some computer and/or life science background. This program is useful for students who desire to explore this new information science in which computers help to simulate, visualize, and analyze genetic and biological information. It also provides an introduction to the fundamental scientific and computational concepts, methods, and tools central to the growing field of computer applications in biotechnology.

BIOT-112	Introduction to Bioinformatics	2
BIOT-121	Biotechnology Careers	1
CS-131/BIOT-131	Computing Concepts in Biotechnology	4
CS-133/BIOT-133	Introduction to SAS Programming	3
CS-141B/BIOT-141B	SAS Graphing and ODS OR	2
CS-143/BIOT-143	Advanced SAS Programming OR	(3)
CS-133A/BIOT-133A	Data Analysis Using SAS	<u>(3)</u>
		12-13

EARTH AND ENVIRONMENTAL SCIENCES

This Certificate of Accomplishment signifies that students have received basic knowledge of the earth sciences, environmental problems, and skills, which facilitate paraprofessional employment such as environmental technician, field assistant, as well as internships with various city, county, state, and private agencies. The certificate also provides a good foundation for continued study in the broad and expanding field of environmental sciences.

BIOL-108	Human Ecology	3
GEOG-121	Introduction to Geographic Information Systems (GIS)	2
GEOL-102	Introduction to Oceanography	3
GEOL-102L	Oceanography Laboratory	1
GEOL-103	Paleontology and Dinosaurs	3
GEOL-103L	Paleontology Laboratory	1

Choose from the following:

GEOG-101	Physical Geography OR	4
GEOL-101	Introduction to Geology	<u>(4)</u>
		17

ENGINEERING

This certificate demonstrates that students have completed classes that serve as a beginning foundation for a career in engineering. These courses emphasize the application of scientific and mathematical principles to solving practical problems.

MATH-104	Differential Equations	5
PHYS-141	Electricity and Magnetism	4

Choose one course from the following:

ENGI-120	Engineering Mechanics – Statics OR	3
ENGI-130	Electric Circuit Analysis OR	<u>(4)</u>
ENGI-140	Materials Engineering	<u>(4)</u>
		12-13

ENVIRONMENTAL STEWARDSHIP

This Certificate of Accomplishment signifies that students have completed coursework in biological, human, socioeconomic, and political principles as they relate to and are influenced by the environment. The courses include an emphasis on a scientific understanding of the environment, social and economic concepts, and an awareness of the behaviors that protect or damage the earth and its resources. On completion of this certificate students will have the ability to better understand their relationship with the planet and obtain an understanding of how their behavior (including energy and natural resource use) affects the environment they inhabit. This certificate provides an excellent background for the various careers in the fields of environmental studies, environmental sciences, public policy, and energy management.

ENVS-101	Natural Resource Management	3
ENVS-102	Environmental Law and Regulations	3
ENVS-103	The Environment and Human Health	3
ENVS-108	Human Ecology	3
ENVS-142	Environmental Biology	<u>4</u>
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GEOGRAPHIC INFORMATION SYSTEMS (GIS)

GIS is a computer-based database management system for capture, storage, retrieval, analysis, and display of spatial data. Students who complete this program will be better prepared to map data for decision-making in business, environmental protection, risk assessment, utility planning and management, emergency response, land use planning, transportation planning, delivery route planning, real estate, and crime prevention.

GEOG-121	Introduction to Geographic Information Systems (GIS)	2
GEOG-122	Environmental GIS	2
GEOG-123	GIS Projects	1

Choose one course or combination of courses from the following: 3-5

ANTH-102	Cultural Anthropology	(3)
ANTH-105	Field Archaeology	(3)
ENVS-108	Human Ecology	(3)
GEOG-101	Physical Geography	(4)
GEOG-102	Cultural Geography	(3)
GEOG-104	The World's Nations	(3)
GEOG-105	California Geography	(3)
GEOL-101	Introduction to Geology	(4)
RE-122	Real Estate Practice	(3)
SOC-102	Social Problems of a Diverse Society	<u>(3)</u>
		8-10

GEOGRAPHY: CULTURAL

This Certificate of Accomplishment signifies that students have received basic training in regional variations of the world, as well as human modification of the physical environment. Upon completion of this certificate students will have lab experience with map analysis, weather, and the earth's landform features and will be educated in current theories of how different cultures use, abuse, or otherwise change the earth. This certificate provides an excellent background for careers in public policy and environmental impact.

BIOL-108	Human Ecology	3
GEOG-101	Physical Geography	4
GEOG-102	Cultural Geography	3
GEOG-104	The World's Nations	<u>3</u>
		13

GEOGRAPHY: PHYSICAL

The Physical Geography Certificate is awarded for studies in geology and related courses; emphasis is placed on human modification of the physical environment and ecology. Students explore weather and climate, land forms, soil, water quality, and environmental management. This certificate is a good foundation for students interested in environmental fields.

GEOG-101	Physical Geography	4
GEOG-104	The World's Nations	3
GEOL-101	Introduction to Geology	4

Choose one course from the following:

BIOL-108	Human Ecology OR	3
BIOL-140	Sierra Nevada Natural History	<u>(3)</u>
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GEOLOGY

This Certificate of Accomplishment signifies that students have received basic knowledge in geological sciences and skills, which facilitate paraprofessional employment such as geological technician and geological field assistant. It also provides a good foundation for continued study in the field of geology.

GEOG-121	Introduction to Geographic Information Systems (GIS)	2
GEOL-101	Introduction to Geology	4
GEOL-102	Introduction to Oceanography	3
GEOL-102L	Oceanography Laboratory	1
GEOL-103	Paleontology and Dinosaurs	3
GEOL-103L	Paleontology Laboratory	<u>1</u>
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MATHEMATICS: APPLIED

The certificate in Applied Math provides students with the mathematical background required to succeed in subsequent courses in math, physics, and engineering.

MATH-101C	Calculus with Analytic Geometry	5
MATH-104	Differential Equations	5
PHYS-140	Mechanics	<u>4</u>
		14

MATHEMATICS: PURE

The certificate in Pure Math provides students with the mathematical background required to succeed in subsequent courses in math, physics, computer science, and engineering. This certificate differs from that in Applied Math due to the inclusion of Linear Algebra. Linear Algebra provides students with what is often their first taste of the theoretical math seen in upper division courses.

MATH-101C	Calculus with Analytic Geometry	5
MATH-103	Introduction to Linear Algebra	3
MATH-104	Differential Equations	<u>5</u>
		13

PALEOBIOLOGY/NATURAL HISTORY

This Certificate of Accomplishment signifies that students have received basic knowledge in natural sciences and skills, which facilitate paraprofessional employment such as geological/biological field assistant and field naturalist. It also provides a good foundation for continued study in a broad variety of scientific fields including Biology, Geology, and Paleontology.

ANTH-101	Physical Anthropology	4
BIOL-130	Introduction to Biology	4
GEOL-103	Paleontology and Dinosaurs	3
GEOL-103L	Paleontology Laboratory	1

Choose one from the following:

GEOG-101	Physical Geography OR	4
GEOL-101	Introduction to Geology	<u>(4)</u>
		16-17

PHYSICAL SCIENCE

The Certificate in Physical Science is awarded for studies of the physical world from the very small to the infinite. Upon completion of this certificate students will have investigated such phenomena as light, energy, the states of matter, chemical reactions, the formation of planet earth, and its place in the universe. This certificate provides an excellent foundation for further studies in science education and other fields.

PHYS-108	Survey of Physics	3
Choose one course from the following:		
CHEM-101A	General Chemistry OR	5
CHEM-106A	Principles of Chemistry OR	(4)
CHEM-108	Survey of Chemistry	(3)
Choose one group from the following:		
GEOL-101	Introduction to Geology OR	4
GEOL-102	Introduction to Oceanography AND	(3)
GEOL-102L	Oceanography Laboratory	(1)
Choose one group from the following:		
ASTR-101A	General Astronomy of the Solar System AND	3
ASTR-102	General Astronomy Laboratory	1
	OR	
ASTR-101B	General Astronomy Beyond the Solar System AND	(3)
ASTR-102	General Astronomy Laboratory	<u>(1)</u>
		14-17

PHYSICS: ADVANCED

This certificate provides students with a solid physical and mathematical foundation of the general principles and theorems of physics, as well as experience with measurements of important physical quantities in the fields of mechanics, electricity and magnetism, optics and thermal physics.

Upon completion of this certificate students will be very well prepared to engage in continued and fundamental studies in the fields of engineering, physics, mathematical physics, or astronomy. The certificate also prepares students to work in various research institutions and companies as research assistant or on internships.

MATH-101C	Calculus with Analytic Geometry	5
PHYS-140	Mechanics	4
PHYS-141	Electricity and Magnetism	4
PHYS-142	Optics, Heat, and Modern Physics	4
		17

PHYSICS: INTRODUCTORY

This certificate provides students with a solid foundation in the general principles of physics, as well as experience with a wide variety of mechanical and electrical measurement techniques. In addition, students will gain a deeper and concrete understanding of the properties of materials and matter in the solid, liquid, and gaseous state and of the experimental processes involved in the measurement and analysis of these properties.

This certificate presents students with material that forms the necessary basis for continued study in many fields of science, in particular the biosciences and the earth and environmental sciences. The certificate also prepares students for paraprofessional employment in the form of research internships with various city, county, state, and private agencies and various technician positions in the fields of electrical and environmental technology.

MATH-181	Trigonometry	3
PHS-135	Physical Science	4
PHYS-120	Introduction to Physics I	4
PHYS-121	Introduction to Physics II	<u>4</u>
		15