

Cabinet and Furniture Technology (CFT)

Contact the Trade and Industry Department for further information.
(760) 744-1150, ext. 2545
Office: T-102A
For transfer information, consult a Palomar College Counselor.

Associate in Science Degrees -

AS Degree requirements are listed in Section 6 (green pages).

- Cabinetmaking and Millwork
- Carving Technology
- Case Furniture Construction/Manufacturing
- Guitar Making Technology
- Lathe Turning Technology
- Table and Chair Manufacturing
- Veneering Technology
- Woodworking Skills Technology

Certificates of Achievement -

Certificate of Achievement requirements are listed in Section 6 (green pages).

- Cabinetmaking and Millwork
- Carving Technology
- Case Furniture Construction/Manufacturing
- Guitar Making Technology
- Lathe Turning Technology
- Table and Chair Manufacturing
- Veneering Technology
- Woodworking Skills Technology

PROGRAMS OF STUDY

Cabinetmaking and Millwork

This program will prepare students to make a living at cabinetmaking. It provides the student with the theory and skills needed for employment and/or self employment in the field of cabinetmaking and millwork. Program begins with the basic safe use of tools and machines and basic woodworking processes. Specific and practical skills and knowledge of the cabinetmaking and millwork industries are covered with required and elected coursework.

A.S. DEGREE MAJOR OR CERTIFICATE OF ACHIEVEMENT

Program Requirements		Units
CFT 100	Fundamentals of Woodworking	4
CFT 105	Machine Woodworking/Furniture	4
CFT 108	Business Woodworking	2
CFT 165A	Cabinetry Design/Face Frame and	4
CFT 167A	Cabinetry Production/Face Frame or	4
CFT 165B	Cabinetry Design/European and	4
CFT 167B	Cabinetry Production/European	4
CFT 168	Cabinetmaking/Architectural Millwork	2
CFT 169	Cabinetmaking/Computer Cabinet Layout	2
CFT 185	Machine Tool Set-Up and Maintenance	2
CFT 195	Finishing Technology/Touch-Up and Repair	2
Electives (Select one course)		
CFT 163	Plastic Laminate Fabrication Techniques	1
CFT 169	Cabinetmaking/Computer Cabinet Layout	2
TOTAL UNITS		27-28

Carving Technology

Carving Technology prepares students to make a living at woodcarving. Students explore use of tools and techniques used in carving wood as it applies to furniture and architectural millwork. Students will begin by gaining skill in simple layouts and learn to sharpen and maintain tools. As student progresses, both low and high relief carving as well as incised lettering will be mastered. Period furniture and architectural carvings are eventually mastered. Students will be qualified carvers in furniture shop or prepared to start own business.

A.S. DEGREE MAJOR OR CERTIFICATE OF ACHIEVEMENT

Program Requirements

CFT 100	Fundamentals of Woodworking	4
CFT 108	Business Woodworking	2
CFT 118	Furniture Design Development or	2
CFT 153	Studio Furniture Design I	2
CFT 149	Hand Joinery I	2
CFT 187	Introduction to Carving	2
CFT 188	Intermediate Carving	2
CFT 189	Advanced Carving	2
CFT 195	Finishing Technology/Touch-Up and Repair	2

Electives (Select 4 units)

CFT 142	The Art and Craft of Planemaking	2
CFT 143	Decorative Box Making	2
CFT 144	Production Wood Products I	1
CFT 170	Workbench Design and Production	2
CFT 173	Bamboo Fly Rod Building	2
CFT 105	Machine Woodworking/Furniture	4
CFT 110A	Period Case Furniture Design	4
CFT 111A	Period Case Furniture Production	4

TOTAL UNITS 22

Case Furniture Construction/Manufacturing

This program will prepare students to make a living manufacturing case furniture. The emphasis will be on utilizing construction processes and building skills to fabricate solid wood furniture with doors and drawers. By studying historic period furniture pieces students will apply traditional methods of construction to modern and contemporary designs while also developing production methods to increase efficiency and profit. Students will learn to work with clients to design and construct either period furniture pieces or custom contemporary pieces.

A.S. DEGREE MAJOR OR CERTIFICATE OF ACHIEVEMENT

Program Requirements

CFT 100	Fundamentals of Woodworking	4
CFT 105	Machine Woodworking/Furniture	4
CFT 108	Business Woodworking	2
CFT 110A	Period Case Furniture Design and	4
CFT 111A	Period Case Furniture Production or	4
CFT 110B	Contemporary Case Furniture Design and	4
CFT 111B	Contemporary Case Furniture Production	4
CFT 118	Furniture Design Development or	2
CFT 153	Studio Furniture Design I	2
CFT 195	Finishing Technology/Touch-Up and Repair	2

Electives (Select 2 units)

CFT 142	The Art and Craft of Planemaking	2
CFT 143	Decorative Box Making	2
CFT 148	Marquetry, Inlay and Veneering	2

CFT 169	Cabinetmaking/Computer Cabinet Layout	2
CFT 170	Workbench Design and Production	2
CFT 175	Jigs/Fixtures and Routers	2
CFT 185	Machine Tool Set-Up and Maintenance	2
TOTAL UNITS		24

Guitar Making Technology

Guitar Making Technology will prepare students to make a living or begin a career as a maker of guitars or as a guitar repair technician. Students will begin by gaining competency in basic woodworking processes including hand tool and power machine usage, finishing, and safety. During the course work students will construct up to four instruments including a ukulele, an electric guitar, a steel string guitar and an arch top guitar. Business building is thoroughly covered. This is a demanding and highly technical program. Students are expected to be dedicated, determined and committed.

A.S. DEGREE MAJOR OR CERTIFICATE OF ACHIEVEMENT

Program Requirements

CFT 100	Fundamentals of Woodworking	4
CFT 108	Business Woodworking	2
CFT 132A	Ukulele Making I/Tenor Ukulele	4
CFT 133A	Guitar Technician I/Set-Up	2
CFT 134A	Electric Guitar Construction/Solid Body	2
CFT 135	Acoustic Guitar Making I	4
CFT 136	Acoustic Guitar Making II	4
CFT 149	Hand Joinery I	2
CFT 195	Finishing Technology/Touch-Up and Repair	2

Electives (Select 2 or more units)

CFT 130	Stringed Instruments I	3 - 5
CFT 131	Stringed Instruments II	3 - 5
CFT 132B	Ukulele Making II	4
CFT 133B	Guitar Technician II/Major Repair	2
CFT 134B	Electric Guitar Construction II/Custom	4
CFT 137	Arch Top Guitar Construction I	4
CFT 138	Arch Top Guitar Construction II	4

TOTAL UNITS **28**

Lathe Turning Technology

This program prepares students to make a living as a wood turner. All aspects of turning will be explored such as making tools and household objects, period and studio furniture applications, architectural applications, vessels and hollow forms. Basic and advanced tool use, application and sharpening will be included. Students will be able design and fabricate turned period furniture parts, contemporary furniture parts, and custom furniture parts. Students will be able to design and fabricate functional items such as tool handles, platters vessels, bowls, as well as similar studio art pieces. Students will also be able to design a line of turned pieces and be able to market pieces in shows, on line and in galleries.

A.S. DEGREE MAJOR OR CERTIFICATE OF ACHIEVEMENT

Program Requirements

CFT 100	Fundamentals of Woodworking	4
CFT 108	Business Woodworking	2
CFT 118	Furniture Design Development	2
	or	
CFT 153	Studio Furniture Design I	2
CFT 176	The Lathe - An Introduction to Woodturning	2
CFT 177	Lathe II - Intermediate Turning	2
CFT 178	Lathe III - Advanced Turning	2
CFT 195	Finishing Technology/Touch-Up and Repair	2

Electives (Select 2 units)

CFT 105	Machine Woodworking/Furniture	4
CFT 143	Decorative Box Making	2
CFT 155	Classic American Chair Designs	2
CFT 173	Bamboo Fly Rod Building	2
CFT 185	Machine Tool Set-Up and Maintenance	2

TOTAL UNITS **18**

Table and Chair Manufacturing

Table and chair furniture is unique in that it is highly interactive with people who use them. Design and joinery must consider comfort, esthetics and structure. This program will prepare students to make a living manufacturing table and chair furniture. The study of historic period pieces will enable students to apply traditional methods of construction to modern and contemporary designs. The finest furniture in the world is handmade and yet production methods can/will be applied to increase efficiency and profit.

A.S. DEGREE MAJOR OR CERTIFICATE OF ACHIEVEMENT

Program Requirements

CFT 100	Fundamentals of Woodworking	4
CFT 108	Business Woodworking	2
CFT 118	Furniture Design Development	2
	or	
CFT 153	Studio Furniture Design I	2
CFT 149	Hand Joinery I	2
CFT 155	Classic American Chair Designs	2
CFT 159A	Chair and Tables/Prototype Construction I	2
CFT 159B	Chair and Tables/Prototype Construction II	2
CFT 160A	Chairs and Tables/Production Manufacturing I	2
CFT 160B	Chairs and Tables/Production Manufacturing II	2
CFT 195	Finishing Technology/Touch-Up and Repair	2

Electives (Select 2 units)

CFT 142	The Art and Craft of Planemaking	2
CFT 156	Advanced Classic American Chair Designs	2
CFT 170	Workbench Design and Production	2
CFT 173	Bamboo Fly Rod Building	2
CFT 180	Wood Bending and Lamination/Wood Technology	2
CFT 185	Machine Tool Set-Up and Maintenance	2
CFT 198	Advanced Wood Finishing	2

TOTAL UNITS **24**

Veneering Technology

The world's most beautiful woods are processed into veneers. Veneered furniture has a rich history in both period and contemporary furniture. This program will prepare students to make a living manufacturing veneered furniture. The study of historic period pieces will enable students to apply traditional methods of construction to modern and contemporary designs. Students will be able to design and fabricate period furniture as well as contemporary furniture pieces which use veneer as the primary visual wood or utilize veneer in the visual design elements of the piece. Students will be able to work with a client to design and fabricate commissioned veneered furniture pieces. Students will also be able to design a line of furniture, which can be fabricated, utilizing a combination of production methods of hand craftsmanship. The finest furniture in the world is handmade and yet production methods can/will be applied to increase efficiency and profit.

A.S. DEGREE MAJOR OR CERTIFICATE OF ACHIEVEMENT

Program Requirements

CFT 100	Fundamentals of Woodworking	4
CFT 105	Machine Woodworking/Furniture	4
CFT 108	Business Woodworking	2
CFT 118	Furniture Design Development	2
	or	

CFT 153	Studio Furniture Design I	2
CFT 148	Marquetry, Inlay and Veneering	2
CFT 151	Veneering Technology I	2
CFT 152	Veneering Technology II	2
CFT 195	Finishing Technology/Touch-Up and Repair	2

Electives (Select 2 units)

CFT 110A	Period Case Furniture Design	4
CFT 111A	Period Case Furniture Production	4
CFT 142	The Art and Craft of Planemaking	2
CFT 143	Decorative Box Making	2
CFT 144	Production Wood Products I	1
CFT 145	Production Wood Products II	1
CFT 180	Wood Bending and Lamination/Wood Technology	2

TOTAL UNITS 22

Woodworking Skills Technology

The finest furniture in the world is hand made. Skilled craftsman are rare and valuable. There is always a market for quality. This program will prepare students to make a living at woodworking with an emphasis on hand skills, traditional methods and European craftsmanship. Students will gain competence in the use of hand tools, power tools, and power machines and be able to properly select and safely use/operate them. Students will be able efficiently sharpen all of hand tools used. Students will gain basic proficiency in the following processes/techniques/skills; lathe turning, carving, wood bending, veneering, hand joinery and finishing. Students will also be able to write a business plan and gain an understanding of the operations of running a small business.

**A.S. DEGREE MAJOR OR
CERTIFICATE OF ACHIEVEMENT****Program Requirements**

CFT 100	Fundamentals of Woodworking	4
CFT 108	Business Woodworking	2
CFT 118	Furniture Design Development	2
	or	
CFT 153	Studio Furniture Design I	2
CFT 149	Hand Joinery I	2
CFT 151	Veneering Technology I	2
CFT 176	The Lathe - An Introduction to Woodturning	2
CFT 180	Wood Bending and Lamination/Wood Technology	2
CFT 187	Introduction to Carving	2
CFT 195	Finishing Technology/Touch-Up and Repair	2

Electives (Select 2 units)

CFT 142	The Art and Craft of Planemaking	2
CFT 143	Decorative Box Making	2
CFT 144	Production Wood Products I	1
CFT 145	Production Wood Products II	1
CFT 155	Classic American Chair Designs	2
CFT 156	Advanced Classic American Chair Designs	2
CFT 173	Bamboo Fly Rod Building	2
CFT 175	Jigs/Fixtures and Routers	2
CFT 182	Timber Framing Technology	3

TOTAL UNITS 22

COURSE OFFERINGS

Courses numbered under 100 are not intended for transfer credit.

CFT 97 Cabinet and Furniture Technology Topics (.5 - 4)

Units awarded in topics courses are dependent upon the number of hours required of the student. Any combination of lecture and/or laboratory may be scheduled by the department. Refer to Class Schedule.

Topics in Cabinet and Furniture Technology. See Class Schedule for specific topic covered. Course title will designate subject covered.

CFT 100 Fundamentals of Woodworking (3, 4)

1½ or 2 hours lecture - 4½, or 6 hours laboratory

Transfer acceptability: CSU

An introductory course in design and construction of wood products. Survey, use, care and selection of woodworking machines and hand tools. Explanation of the basic techniques of milling, joinery, assembly, and finishing.

CFT 105 Machine Woodworking/Furniture (3, 4)

1½ or 2 hours lecture - 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 100

Transfer acceptability: CSU

Study, design, and development of practical applications for basic cabinet construction as utilized by the wood products industry. Includes partitions, face frame, carcass, and basic door and drawer construction. Operation of woodworking machines, tools and processes, techniques, and care and suitability of tools and machines.

CFT 108 Business Woodworking (2, 3, 4)

2, 3, or 4 hours lecture

Transfer acceptability: CSU

Prepare woodworkers to start and run a business. Topics include developing a business plan, strategies for shop efficiency, and tax and legal requirements.

CFT 110A Period Case Furniture Design (3, 4)

1½ or 2 hours lecture - 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105

Transfer acceptability: CSU

Focus is on the design of a period furniture project. Use of advanced level of joinery utilizing design; mortise and tenon; dovetails; frame and panel; and other joinery used in period case furniture.

CFT 110B Contemporary Case Furniture Design (3 - 4)

1½ - 2 hours lecture - 4½ - 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105

Transfer acceptability: CSU

Design of a contemporary furniture project. Use advanced level of joinery utilizing design; mortise and tenon; dovetails; frame and panel; and other joinery used in contemporary case furniture.

CFT 111A Period Case Furniture Production (3, 4)

1½ or 2 hours lecture - 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 110A

Transfer acceptability: CSU

Production phase of period case furniture. Emphasis is on the completion of a solid wood period case furniture piece. Includes details such as traditional joinery; door and drawer construction methods; furniture hardware; and various finishing choices. Creation of special molding and spindle turnings for decorating the carcass will also be explored.

CFT 111B Contemporary Case Furniture Production (3, 4)

1½ or 2 hours lecture - 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 110B

Transfer acceptability: CSU

Production phase of contemporary case furniture. Emphasis is on the completion of a solid wood contemporary case furniture piece. Includes traditional joinery; door and drawer construction; furniture hardware; finishing choices; and wood lamination. Creation of special molding and spindle turnings and CNC milling will also be explored.

CFT 118 Furniture Design Development (2)

1 hour lecture - 3 hours laboratory

Transfer acceptability: CSU

Fundamental elements and principles of design while developing unique design methodologies and creative practices. Practical skills such as sketching, drawing, drafting, and model making will be stressed. In addition, students will explore wood as a creative medium by experimenting with a variety of surface textures and treatments.

CFT 120 Advanced Furniture Lab (1.5, 3, 4.5, 6, 7.5, or 9 hours laboratory)*1 1/2, 3, 4 1/2, 6, 7 1/2, or 9 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Laboratory for students who need additional lab time to complete difficult, complex projects. Students will work under the supervision of an instructor.

CFT 122 Cabinetmaking Construction Lab (1.5, 3, 4.5, 6, 7.5, or 9 hours laboratory)*1 1/2, 3, 4.5, 6, 7 1/2, or 9 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Laboratory for students who need additional lab time to complete difficult cabinetry and other complex projects. Students will work under the supervision of an instructor.

CFT 124 Chair and Table Construction Lab (1.5, 3, 4.5, 6, 7.5, or 9 hours laboratory)*1 1/2, 3, 4 1/2, 6, 7 1/2, or 9 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Provides additional laboratory time to complete complex projects required in other classes.

CFT 128 Stringed Instruments Lab (1.5, 3, 4.5, 6, 7.5, or 9 hours laboratory)*1 1/2, 3, 4 1/2, 6, 7 1/2, or 9 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Laboratory for students who need additional lab time to complete difficult stringed instruments or other complex projects. Students will work under the supervision of an instructor.

CFT 130 Stringed Instruments I (1.5, 2, or 2 1/2 hours lecture - 4 1/2, 6, or 7 1/2 hours laboratory)*1 1/2, 2, or 2 1/2 hours lecture - 4 1/2, 6, or 7 1/2 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Through the fabrication of a steel stringed guitar, students will study the: history, tone theory, construction processes, materials, finishing and set up of stringed instruments. Students will work together, production style, milling raw lumber from local sources into guitar part blanks. Students will then work individually constructing their own guitar. Traditional and modern methods of construction and fabrication are explored.

CFT 131 Stringed Instruments II (1.5, 2, or 2 1/2 hours lecture - 4 1/2, 6, or 7 1/2 hours laboratory)*1 1/2, 2, or 2 1/2 hours lecture - 4 1/2, 6, or 7 1/2 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 130 and CFT 100**Transfer acceptability:** CSU

A continuation of CFT 130, and the second semester of a year long curriculum. Students will complete the construction of the body, neck, and other components of the instrument. Finishing and final set-up techniques will be covered and utilized by students.

CFT 132A Ukulele Making I/Tenor Ukulele (1.5 - 2 1/2 hours lecture - 4 1/2 - 7 1/2 hours laboratory)*1 1/2 - 2 1/2 hours lecture - 4 1/2 - 7 1/2 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Introduction to the processes and construction details for building a tenor ukulele. Major topics include acoustic theory and mill and fabrication of components for stringed instruments. Each student must complete an individual tenor ukulele.

CFT 132B Ukulele Making II (1.5 - 2 1/2 hours lecture - 4 - 7 1/2 hours laboratory)*1 1/2 - 2 1/2 hours lecture - 4 - 7 1/2 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 132A, or concurrent enrollment in CFT 132A**Transfer acceptability:** CSU

Students will construct an ukulele while concurrently preparing jigs, molds and fixtures for ukulele production. Students will also explore advance techniques of embellishment and various ukulele models.

CFT 133A Guitar Technician I/Set-Up (1 - 2 hours lecture - 3 - 6 hours laboratory)*1 - 2 hours lecture - 3 - 6 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Techniques are used to analyze and diagnose common guitar repair issues. Determine options and techniques in the repair of common problems, with an emphasis on basic set-up and minor repair. A basic preparation course for guitar repair technician positions.

CFT 133B Guitar Technician II/Major Repair (1 - 2 hours lecture - 3 - 6 hours laboratory)*1 - 2 hours lecture - 3 - 6 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 133A**Transfer acceptability:** CSU

Use techniques to analyze and diagnose common guitar repair issues. Determine options and techniques in the repair of common problems; with an emphasis on major repair and advanced set-up. A preparation course for guitar repair technician positions.

CFT 134A Electric Guitar Construction I/Solid Body (1, 1 1/2, or 2 hours lecture - 3, 4 1/2, or 6 hours laboratory)*1, 1 1/2, or 2 hours lecture - 3, 4 1/2, or 6 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

The construction of a simple solid body electric guitar, either a "strat" or "tele" style, provides basic processes and construction details involved in the building of electric guitars, as well as the basic electronics. Skills gained in other CFT courses will be used to mill and fabricate parts. Production work and completion of an electric guitar are required. Excellent woodworking skills are essential. An extremely demanding and fast-paced course.

CFT 134B Electric Guitar Construction II/Custom (1 - 2 hours lecture - 3 - 6 hours laboratory)*1 - 2 hours lecture - 3 - 6 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 134A**Transfer acceptability:** CSU

Construction of a contour top electric guitar, such as a "Les Paul" style or a semi-hollow body guitar. Provides processes and construction details involved in the building of high-end and custom electric guitars, as well as the basic electronics. Skills gained in other CFT courses will be used to mill and fabricate parts. Production work and completion of an electric guitar are required. Excellent woodworking skills are essential. An extremely demanding and fast-paced course. Students will also be encouraged to build jigs forms and fixtures to aid in production.

CFT 135 Acoustic Guitar Making I (1.5, 2, or 2 1/2 hours lecture - 4 1/2, 6, or 7 1/2 hours laboratory)*1 1/2, 2, or 2 1/2 hours lecture - 4 1/2, 6, or 7 1/2 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

First course of a two-semester sequence. Prepares students for a career as a luthier while studying the history, anatomy, construction methods, design, tone, and sound theory of acoustic guitars. Construction of either a nylon string or steel string acoustic guitar is required. Considerable prior woodworking/instrument making experience is recommended.

CFT 136 Acoustic Guitar Making II (1.5, 2, or 2 1/2 hours lecture - 4 1/2, 6, or 7 1/2 hours laboratory)*1 1/2, 2, or 2 1/2 hours lecture - 4 1/2, 6, or 7 1/2 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 135**Transfer acceptability:** CSU

Second course of a two-semester sequence. Prepares students for a career as a luthier while studying the history, anatomy, construction methods, design, tone, and sound theory of acoustic guitars. Construction of either a nylon string or steel string acoustic guitar is required. Considerable prior woodworking/instrument making experience is recommended.

CFT 137 Arch Top Guitar Construction I (3, 4, 5)

1½, 2, or 2½ hours lecture - 4½, 6, or 7½ hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

First course of a two-semester sequence. Prepares students for a career as a luthier while studying the history, anatomy, construction methods, design, tone, and sound theory of acoustic guitars. Construction of an Arch Top Guitar (somewhat like a violin with the front and back plates carved to a thin arched shape from thick stock) is required. Considerable prior woodworking/instrument making experience is recommended.

CFT 138 Arch Top Guitar Construction II (3, 4, 5)

1½, 2, or 2½ hours lecture - 4½, 6, or 7½ hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 137**Transfer acceptability:** CSU

Second course of a two-semester sequence. Prepares students for a career as a luthier while studying the history, anatomy, construction methods, design, tone, and sound theory of acoustic guitars. Construction of an Arch Top Guitar (somewhat like a violin with the front and back plates carved to a thin arched shape from thick stock) is required. Considerable prior woodworking/instrument making experience is recommended.

CFT 141 Making Woodworking Tools (1, 2, 3)

½, 1, or 1½ hours lecture - 1½, 3, or 4½ hours laboratory

Transfer acceptability: CSU

Making traditional woodworking tools used to make furniture and chairs. Topics include the history and uses of tools, materials and design, layout of the stock, equipment needed to make and finish the tools, sharpening and fitting the blades, forging and heat treating steel parts. Types of tools include spoke shaves, shaving horses, steaming devices and bending forms.

CFT 142 The Art and Craft of Planemaking (1, 2, 3)

½, 1, or 1½ hours lecture - 1½, 3, or 4½ hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Teaches students to make wooden hand planes. Through the use of lecture, hand-outs, demonstrations and videos, the following topics will be covered: the history of planemaking; tuning and using wooden and metal planes; designing a plane; making and tuning laminated planes; cutting, tempering and sharpening a plane iron; designing, making and using a wooden plane.

CFT 143 Decorative Box Making (2, 3, 4)

1, 1½ or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

Concentrates on the skills and techniques needed to make finely crafted heirloom quality boxes. Types of boxes include: jewelry, cigar humidors, and silver chest. Topics include: design, function, selection of materials, construction techniques, partitions, linings, hardware, assembly techniques, hinge installation, and finishing techniques.

CFT 144 Production Wood Products I (1, 2, 3, 4)

½ or 1, 1½ or 2 hour lecture - 1½ or 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Methods and techniques of high production manufacturing are learned through lecture, demonstration and extensive lab work in a production mode. The wood products manufactured in this course may be donated to local charities.

CFT 145 Production Wood Products II (1, 2, 3, 4)

½ or 1, 1½ or 2 hour lecture - 1½ or 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 144**Transfer acceptability:** CSU

Students will be Team Leaders/Managers in design, planning, time and material managements, and production. Includes organizing schedules, material flow, and production techniques. The wood products manufactured in this course may be donated to local charities.

CFT 148 Marquetry, Inlay and Veneering (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 100 and CFT 151**Transfer acceptability:** CSU

Examines the history of Marquetry. Students will use the tools necessary to complete a Marquetry project which includes: veneer hammer, hide and other glues, veneer tape, scroll saw, veneer saw and related tools and equipment. The various methods of cutting veneers will be examined as well as methods for cutting, assembling and installing inlay.

CFT 149 Hand Joinery I (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

Exploration of hand tool techniques with application to fine furniture. Skills will be developed through the construction of sample joints and a simple project. Topics include: marking and layout tools, cutting tools, use of the workbench and its accessories, hand saws and their use, Japanese vs. Western tools, dovetail joinery, mortise and tenon joinery, squaring and sizing with a hand plane, sharpening hand tools and building a simple carcass.

CFT 150 Hand Joinery II (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 149**Transfer acceptability:** CSU

Comprehensive study of specialized woodworking techniques. The emphasis of this course will be on the development of hand tool skills. Learning exercises will be completed making traditional joinery typical of fine furniture.

CFT 151 Veneering Technology I (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

Introduction to the use of veneers in furniture making. Topics include: understanding veneer as a material, cutting and seaming veneer, pressing veneer using traditional and modern methods, creating sunbursts and other multi-piece matches, using and maintaining various cutting tools and sawing your own veneer.

CFT 152 Veneering Technology II (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 151**Transfer acceptability:** CSU

Advanced veneering techniques which include working with radius shapes, hand and machine, hammer veneering, and installation of bandings and stringings. Demonstration of abilities will be required with the construction of a small piece of furniture.

CFT 153 Studio Furniture Design I (2)

1 hour lecture - 3 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

Exploration of historical design concepts and their application to contemporary work. Development of drawing skills needed to design one of a kind studio furniture.

CFT 154 Studio Furniture Design II (2, 3, 4)

2, 3, or 4 hours lecture

Prerequisite: A minimum grade of 'C' in CFT 153**Transfer acceptability:** CSU

Implementation of students' design concepts created in CFT 153. Exploration of market opportunities and client relationships.

CFT 155 Classic American Chair Designs (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Transfer acceptability: CSU

Chair making which emphasizes the use of traditional chair making tools to shape raw wood into chair parts. Topics include the history of Windsor and Ladder Back chair designs; harvesting raw materials from a tree; proper sharpening of the hand tools; shaping, steam bending, kiln drying and assembling the chair parts; seat weaving; and traditional finishing appropriate to each chair style.

CFT 156 Advanced Classic American Chair Designs (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 155**Transfer acceptability:** CSU

Chair making which emphasizes the use of traditional chair making tools to shape raw wood into chair parts. Skill development and improved craftsmanship is emphasized while learning to make more complex chairs. Advanced chair designs include: bow back, continuous arm, writing arm, double and triple settees and fan back Windsor chairs; Appalachian style three-slat side chair, four-slat arm chair, bar stools, youth rocker and six-slat rocking chair.

CFT 159A Chair and Tables/Prototype Construction I (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

An in-depth study of production chair making. History of chairs making and seating. Design and application of pattern-making techniques on student-selected projects.

CFT 159B Chair and Tables/Prototype Construction II (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

Table design and construction. Covers the history of table making. Design and application of pattern making techniques on student-selected projects. Machine tool operations necessary to produce various table leg, trussel, and base designs.

CFT 160A Chairs and Tables/Production Manufacturing I (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 159A**Transfer acceptability:** CSU

Second semester of a two-semester class (CFT 159A and CFT 160A). Chair and seating construction production and advanced machine tool techniques are used as they relate to chair making. Fine joinery, theory and advanced techniques.

CFT 160B Chairs and Tables/Production Manufacturing II (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 159B**Transfer acceptability:** CSU

Second semester of a two-semester class (CFT 159B and CFT 160B). Development and refinement of table making skills, processes and procedures. Construction of extension and drop-leaf style tables. Joinery and hardware unique to table making.

CFT 163 Plastic Laminate Fabrication Techniques (1, 2)

½ or 1 hour lecture - 1½ or 3 hours laboratory

Transfer acceptability: CSU

Examines the manufacturing process for plastic laminate products, including tools, adhesives, jigs, application and installation techniques. Lectures, demonstrations, and hands-on exercises will give students the opportunity to develop the proficiency and knowledge to design, build and install plastic laminate products.

CFT 164 Cabinet Installation (1, 2)

½ or 1 hour lecture - 1½ or 3 hours laboratory

Transfer acceptability: CSU

Installation of both face frame and European (32mm) cabinetry. Topics include: Understanding wall structure, measuring and planning for installation, review of cabinet construction with emphasis on installation, in-depth discussion of the tools, jigs, and techniques used for installation, installation of lower face frame cabinets, installation of upper European (32mm) cabinets, finished scribing of molding.

CFT 165A Cabinetry Design/Face Frame (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

First course of a two-semester sequence (CFT 165A and CFT 167A). Emphasis is on face frame cabinets. Study of the principles of traditional and European styles of cabinetmaking as used to construct and install cabinetry in residential and commercial applications, with preference given to residential applications.

CFT 165B Cabinetry Design/European (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

First course of a two-semester sequence (CFT 165B and CFT 167B). With an emphasis on European 32mm cabinets. Study of the principles of traditional and European styles of cabinetmaking as used to construct and install cabinetry in residential and commercial applications, with preference given to residential applications.

CFT 166 Cabinetmaking/Production and Manufacturing (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 165A**Transfer acceptability:** CSU

Designed to give students the knowledge and ability to enter the cabinetmaking business. Manufacturing and production techniques will be examined along with design, assembly, and installation. Students will learn to bid on jobs, estimate materials, provide client satisfaction, and produce quality work on a profitable basis.

CFT 167A Cabinetry Production/Face Frame (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 165A**Transfer acceptability:** CSU

Second course of a two-semester sequence. Students will learn and apply the construction methods and installation processes of face frame cabinets by constructing the cabinets designed in CFT 165A.

CFT 167B Cabinetry Production/European (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 165B**Transfer acceptability:** CSU

Second course of a two-semester sequence (CFT 165B and CFT 167B). Students will learn and apply the construction methods and installation processes of European style 32mm cabinets by constructing the cabinets designed in CFT 165B.

CFT 168 Cabinetmaking/Architectural Millwork (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

Historical and modern architectural millworking techniques used in frame and panel systems, doors, fireplaces, wall systems, staircases, and built in components. Hands on experience on student selected projects may include woodcarving, woodturning, construction of doors and windows and the production/installation of moldings.

CFT 169 Cabinetmaking/Computer Cabinet Layout (2, 3)

1 or 1½ hours lecture - 3 or 4½ hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

Selection and application of appropriate software as developed for the cabinet industry. Development of industrial standard cabinet plans and specifications utilizing personal-size computer and software programs.

CFT 170 Workbench Design and Production (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Design and construction of the most basic of woodworking tools, a workbench. Process rough lumber to maximize yield and minimize waste. Students will be allowed to customize the size of their bench to fit individual requirements within limits. However, mass-production techniques will not be sacrificed. In addition, a broad review of woodworking vises and other bench accessories will be conducted so that students will be able to further customize their own bench.

CFT 171 Furniture for the Wood Shop (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

The individual student will be required to design and construct one or more projects from a broad range of furniture-quality accessories for the woodworking shop such as tool totes, tool boxes, chests and cabinets (both stationary and portable), step stools, saw horses or workbench accessories. Particular attention will be paid to artistic and functional design, utility, material selection and joinery techniques. Skills in spindle turning, marquetry and inlay, compound angle joinery, coopering, and veneering will be developed and employed depending on the project selected.

CFT 172 CAD for Cabinets & Furniture (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Transfer acceptability: CSU

Introduction to basic CAD concepts and their direct application to the design and drawing of custom cabinets and furniture, as an alternative to hand drawn plans and a starting point to Computer Assisted Manufacturing.

CFT 173 Bamboo Fly Rod Building (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Instruction in the art of bamboo fly rod building. A bamboo culm will be split, straightened, heat treated, planed and glued. Tips, ferrels, cork handle and reel seat are installed. Wire guides are made and installed. Other projects include fish landing nets, hexagon rod storage tubes, cork lined wooden fly boxes and portable fly tying cases.

CFT 175 Jigs/Fixtures and Routers (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

Theory of production tooling, fixtures, and jigs; design and develop practical applications of production tooling, fixtures and jigs as used in current machines within the industry. Field trips to local industries will allow students to further understand tooling as used in the trades.

CFT 176 The Lathe - An Introduction to Woodturning (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Emphasis on Spindle Turning or turning Between Centers. Students will learn the history of the lathe; the components of the lathe and how to select the best lathe and accessories for their particular turning style. Discussion of tool selection, proper tool sharpening techniques, what to expect from a basic set of turning tools with emphasis on the skew, the gouge, the parting tool and importantly – the handle. Design and fabrication of tool handles, including tool making and tool modification. Additionally, projects will include turning a mallet, tool handles, kitchen utensils, "weed vases" and ornaments. Introduction to bowl turning and turning other than solid wood such as laminates and acrylics.

CFT 177 Lathe II - Intermediate Turning (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 176**Transfer acceptability:** CSU

The study of architectural turning in relation to furniture making and overall advanced turning techniques. Discussion of tool selection, proper tool sharpening techniques, what to expect from a basic set of turning tools, with emphasis on the skew, gouge, parting tool, and an introduction to specialty turning tools. Split turning, offset turning, multi-axis turning, and duplication will be introduced.

CFT 178 Lathe III - Advanced Turning (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 177**Transfer acceptability:** CSU

Continuation of Lathe II - Intermediate Turning. Exploration of techniques and material in-depth, and focus on mastery.

CFT 180 Wood Bending and Lamination/ Wood Technology (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

Principles and practical applications of both wood bending and lamination. Mechanical and chemical means of bending wood studied and developed, specific structure and properties of wood are developed.

CFT 182 Timber Framing Technology (3, 4, 5)

1½, 2, or 2½ hours lecture - 4½, 6, or 7½ hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Timber framing is one of the oldest building systems in the world. Structures are created utilizing heavy timbers jointed via pegged mortise and tenon joints. This course teaches how to design and engineer a modern timber frame using energy efficient systems. Introduction to engineering principles, analyzing loads, architectural design, and layout. In this hands-on class students will build a timber frame structure. The class structure will be rigged and raised by students.

CFT 185 Machine Tool Set up and Maintenance (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Set up, repair, rebuild, and maintain tools and machines used in the wood-related industries. Machine tool operations studies and applied. Consumer information developed to acquaint student with machines and tools within the field. Planned maintenance schedules developed and applied.

CFT 186 Machine Tool/Production Carving (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

Introductory woodcarving course using hand and power machine tools. Design considerations, carving techniques, production carving, and incorporation of woodcarving into cabinetmaking, furniture construction, and architectural millwork.

CFT 187 Introduction to Carving (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Transfer acceptability: CSU

This beginning course in carving introduces students to the tools and techniques used in carving wood. The course includes specifics of available tools, their proper handling and maintenance, as well as discussions of layout and carving methods as applied to furniture and architectural millwork.

CFT 188 Intermediate Carving (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Prerequisite: A minimum grade of 'C' in CFT 187**Transfer acceptability:** CSU

Examines methods relating to both low and high relief carving, as well as incised lettering. More complex layout and carving techniques are undertaken. Concepts such as setting-in and blocking-out are introduced while modeling, introduced in the beginning course, is more fully developed.

CFT 189 Advanced Carving (2, 3, 4)

1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory

Transfer acceptability: CSU

Advanced carving is a topical study of specific carving applications as they relate to furniture or architectural millwork. Topics are largely gathered from period styles and may include ball and claw feet, Newport shells, and Philadelphia rococo, as well as contemporary interpretations, Art Nouveau, and maritime themes. See Class Schedule for specific period styles/themes to be emphasized.

CFT 190 Specialty and Manufactured Hardware (.5, 1, 2, 3)*½, 1, 2, or 3 hours lecture***Transfer acceptability:** CSU

Survey of traditional, contemporary, European, and Oriental market hardware found in the cabinet and furniture industries, including consumer applications. Exploration and application of various system solutions for given problem(s). Study and application of hinges, K D fasteners, fastening systems, joint systems, drawer guides, and runners.

CFT 195 Finishing Technology/Touch Up and Repair (2, 3, 4)*1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 100**Transfer acceptability:** CSU

Finishes as used in the wood-related fields. Study and use of penetrating, surface, epoxy, catalytic, and resin surface finishes. Preparation to include staining, filling, and glazing. Chemistry of lacquers, urethanes, oils, and enamels. Instruction and practice in the touch-up of existing finishes through use of French polishing, burn-in sticks, and dry aniline staining. Repair of fine furniture as necessary prior to finishing.

CFT 196 Special Problems in Cabinet and Furniture Technology (1, 2, 3, 4, 5, 6)*3, 6, 9, 12, 15, or 18 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 100 or 105**Transfer acceptability:** CSU

A research course through individual contract concentrating in the area of Cabinet and Furniture Technology.

CFT 197 Cabinet and Furniture Technology Topics (.5 - 4)

Units awarded in topics courses are dependent upon the number of hours required of the student. Any combination of lecture and/or laboratory may be scheduled by the department. Refer to Class Schedule.

Transfer acceptability: CSU

Topics in Cabinet and Furniture Technology. See class schedule for specific topic covered. Course title will designate subject covered.

CFT 198 Advanced Wood Finishing (2, 3, 4)*1, 1½, or 2 hours lecture - 3, 4½, or 6 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 195**Transfer acceptability:** CSU

Wood finishing history, processes, and application of multiple colors and complex finishes on furniture. Topics include media, solvents and tools used to apply media, faux finishes, gilding, coloring the finishing materials, turning broken or missing parts, and veneer repair.

CFT 295 Directed Study in Woodworking (1, 2, 3, 4, 5, 6)*48, 96, 144, 192, 240, or 288 hours laboratory***Prerequisite:** A minimum grade of 'C' in CFT 105**Transfer acceptability:** CSU

Independent study in furniture making, cabinet making, shop layout, design, operation, and maintenance for students who have demonstrated advanced skills and/or proficiencies in Cabinet and Furniture Technology subjects and have the initiative to work independently on projects or research outside the context of regularly scheduled classes. Registration requires prior approval of supervising instructor.

Chemistry (CHEM)

Contact the Chemistry Department for further information.

(760) 744-1150, ext. 2505

Office: NS-355B

Associate in Science Degrees -

AS Degree requirements are listed in Section 6 (green pages).

- Chemistry

Certificates of Achievement -

Certificate of Achievement requirements are listed in Section 6 (green pages).

- Chemistry

PROGRAM OF STUDY**Chemistry**

Provides the background to begin upper division course work and prepares the student for entry level jobs that require a knowledge of chemistry. The student is advised to check with the institution to which he/she wishes to transfer for additional courses, which may be required.

**A.S. DEGREE MAJOR OR
CERTIFICATE OF ACHIEVEMENT**

Program Requirements		Units
CHEM 110	General Chemistry	3
CHEM 110L	General Chemistry Laboratory	2
CHEM 115	General Chemistry	3
CHEM 115L	General Chemistry Laboratory	2
CHEM 210	Analytical Chemistry	5
CHEM 220	Organic Chemistry	5
CHEM 221	Organic Chemistry	5
TOTAL UNITS		25

COURSE OFFERINGS

Courses numbered under 50 are non-degree courses.

Courses numbered under 100 are not intended for transfer credit.

CHEM 10 Chemistry Calculations (1)*1 hour lecture***Note:** Pass/No Pass grading only

Non-degree Applicable

The basic calculation skills needed for successful performance in CHEM 100, 110, and 115. Areas such as significant figures, exponential numbers, and basic chemical problems are discussed. Emphasizes student practice of chemistry problems.

CHEM 100 Fundamentals of Chemistry (4)*3 hours lecture - 3 hours laboratory***Prerequisite:** One year of high school algebra**Transfer acceptability:** CSU; UC – no credit if taken after CHEM 110

Introductory study of the principles and laboratory techniques of general chemistry. Laboratory must be taken concurrently with lecture.

CHEM 104 General Organic and Biochemistry (5)*3 hours lecture - 6 hours laboratory***Transfer acceptability:** CSU; UC

This course will cover the basic principles of general chemistry, organic chemistry and biochemistry as needed to understand the biochemistry, physiology, and pharmacology of the human body. This course is intended mainly for students pursuing health professions.

CHEM 105 Fundamentals of Organic Chemistry (4)*3 hours lecture - 3 hours laboratory***Prerequisite:** A minimum grade of 'C' in CHEM 100, or CHEM 110 and 110L**Transfer acceptability:** CSU; UC

An introduction to the study of organic chemistry with an emphasis on classification, reactions, and application to allied fields. Laboratory includes techniques of isolation, identification, and synthesis of organic compounds.

CHEM 110 General Chemistry (3)*3 hours lecture***Prerequisite:** A minimum grade of 'C' in CHEM 100 or high school chemistry with laboratory, and two years of high school algebra or MATH 60**Corequisite:** CHEM 110L**Transfer acceptability:** CSU; UC

C-ID CHEM 110 for CHEM 110 and 110L combined; CHEM 120S for CHEM 110, 110L, 115 and 115L combined

Principles of, and calculations in, areas such as atomic structure, solutions, chemical bonding, chemical formulas and equations, gases, energy transformations accompanying chemical changes, and descriptive chemistry.