Approved by California Department of Education
Accredited by Western Association of Schools and Colleges

UC certified "a-g"

Engineering and Design Industry Sector

Architectural Design

Curriculum

Approved by Contra Costa County Board of Education March 6, 2002
California Career Technical Education Standards included
Revised August 27, 2009

CONTRA COSTA COUNTY OFFICE OF EDUCATION

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A Publication of the
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ROP ARCHITECTURAL DESIGN

PHILOSOPHY

ROP delivers state-of-the-art educational programs to high school and adult students to prepare them for challenging careers, higher education and lifelong learning.

PROGRAM GOALS

The goal of the program is to develop students' academic and technical skills, preparing them for:

- College
- Advanced training
- Employment and opportunities for promotion

COURSE TITLE: ROP ARCHITECTURAL DESIGN

CBEDS TITLE/NO: COMPUTER-AIDED DRAFTING/DESIGN — 5705

INDUSTRY SECTOR: Engineering and Design Industry Sector
PATHWAY: Architectural and Structural Engineering Pathway

JOB TITLE/ONET CODE: 17-3011.01 - Architectural Drafters
17-1011.00 - Architects

I. COURSE DESCRIPTION

Architectural Design is a course in which the students express themselves visually and are able to showcase their creativity. Instruction will be given in the following areas: elements of design, architectural history, sketching, and computer design. The course gives the students confidence in organizing and utilizing ideas in new and useful creations, and reinforces concepts and ideas learned in mathematics, art, and social science. Students are guided through a series of projects using computer aided design (CAD) software. Integrated throughout the course are career technical education standards which include basic academic skills, communication, career planning, technology, problem solving, safety, responsibility, ethics, teamwork, and technical knowledge.

Hours: Students may receive up to **360** hours of classroom instruction

Prerequisites: Recommended: Basic Art and Design, Algebra, Geometry, **or** approval of the instructor; must be at least 16 years of age, or a junior or senior

Date revised: August 27, 2009

Articulation: Articulated with Diablo Valley College at Monte Vista and California High Schools.

UC "a-g": This course is certified by the University of California as an "a-g" course in the **"f-Visual and Performing Arts**" category for Contra Costa County ROP. (Note: cannot be used to fulfill

the “g” requirement.) *High schools must include this course on their own “a-g” list in their annual on-line update through the UC Web site.*

II. STUDENT PERFORMANCE OBJECTIVES

The curriculum will be guided by the five major California Visual and Performing Arts Standards: (1) Artistic Perception, (2) Creative Expression, (3) Historical and Cultural Context, (4) Aesthetic Valuing, and (5) Connections, Relationships and Applications

Course Goals and Major Student Outcomes:

1. Develop and expand aesthetic perception.
2. Develop a strong academic foundation in elements of design.
3. Develop a historic perspective of architecture and social environments.
4. Master laboratory techniques and concepts that are essential in design.
5. Develop a knowledge of historical and cultural developments and their influence on modern architecture.
6. Understand that architectural design reflects, records, and shapes history and plays a role in every culture.
7. Develop and expand visual arts knowledge and skills to express architectural ideas imaginatively.
8. Acquire artistic knowledge, perception, and technical skills to express and communicate ideas graphically.
9. Learn techniques in approaching solutions to architectural design problems.
10. Develop a basis for making informed, aesthetic judgments.
11. Develop skill in the graphic presentation of information and ideas.
12. Develop an awareness of careers in the visual arts and architectural design.

Course Objectives:

1. Use the visual elements of line, value, shape, form, color and texture to create a project.
2. Demonstrate how balance, rhythm, movement, variety, proportion, emphasis and unity are used in the design process.
3. Develop pictorial sketches in both isometric and perspective modes.
4. Make decisions and be able to respond to the aesthetic value of architectural design.
5. Learn how to lay out and develop pictorial drawings using shading and shadowing techniques.
6. Use the color wheel to demonstrate an understanding of color composition.
7. Identify the basic types of material and symbols used in architectural drawings.
8. Design a residential room and floor plans that include proper room layout, utilizing architectural symbols, dimensions, notes and schedules.
9. Produce various computer aided architectural drawings and demonstrate proper plotting techniques.
10. Develop a portfolio of work as a tool for both preservation and presentation.
11. Perform visual, verbal, and written presentations.

Expected School-wide Learning Results (ESLRs) for ROP:

1. Demonstrate effective skills in oral and written *communication.*
   - Speak clearly using professional and industry-specific terminology
   - Develop appropriate listening, speaking, and presentation skills
   - Use technology to enhance communication
   - Read and comprehend industry-related material
   - Write effectively in a variety of different formats
2. Demonstrate *job skills* and the behavior and work ethic valued by employers.
   - Use technology to enhance work performance
   - Acquire industry-specific competencies
   - Meet occupational safety standards
   - Demonstrate appropriate business ethics and etiquette
   - Identify short-term and long-range career goals
   - Demonstrate organizational skills such as goal setting and time management
3. Demonstrate the ability to be critical, complex, and creative *thinkers.*
   - Brainstorm and discuss ideas with others
   - Access resources; organize and analyze information
   - Process and apply knowledge to new situations
   - Demonstrate problem-solving, computational, and research skills
4. Work productively both as individuals and as *team members.*
   - Demonstrate initiative and resourcefulness
   - Brainstorm and collaborate with others
   - Demonstrate the ability to assume a leadership role
   - Give and receive constructive feedback

III. COURSE OUTLINE

Course Outline	*Career Technical Education Standards*	*Suggested Activities/Assessment*
A. Orientation (10-20 hrs) 1. Overview of the field of architecture and architectural design a. Historical perspective b. Significant achievements 2. Objectives and requirements 3. Safety Unit a. Review of safety rules b. Ergonomics and computer use c. Safety codes in the field of architecture	Pathway Standards Architectural and Structural Engineering The Architectural and Structural Engineering Pathway provides learning opportunities for students interested in preparing for careers in such areas as architecture, industrial design, and civil engineering. A1.0 Students understand the ways in which architecture is shaped by history and know significant events in the history of structural engineering: A1.1 Know significant historical architectural and structural projects and their effects on society. A1.2 Understand the development of architectural and structural systems in relation to aesthetics, efficiency, and safety. Foundation Standards 6.0 Health and Safety Students understand health and safety policies, procedures, regulations, and practices, including the use of equipment and handling of hazardous materials: 6.1 Know the policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities. 6.2 Understand the critical elements of health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.	o Lecture, PowerPoint presentation, and class discussion. o Browse historical architectural styles at www.greatbuildings.com o http://architecture.about.com/ o Class discussion about safety in the classroom as well as the need for safety codes in architecture
B. Architecture Overview (10-20 hrs)	VPA Standards	o Study a series of architectural styles that relate to one's

Course Outline	*Career Technical Education Standards*	*Suggested Activities/Assessment*
1. Architectural styles a. Historical context b. Design considerations c. Technological advances 2. Drawing types 3. Architectural scales	3.0 Historical and Cultural Context Students analyze the role and development of the visual arts (architecture) in past and present cultures throughout the world, noting human diversity as it relates to visual arts and artists. 3.1 Identify similarities and differences in the purposes of art/architecture created in selected cultures. 3.2 Identify and describe the role and influence of new technologies on contemporary works of art/architecture. 3.3 Identify and describe trends in the visual arts/architecture and discuss how the issues of time, place, and cultural influence are reflected in selected works of art/architecture.	cultural heritage and make a collage or family tree of these styles o Through research, determine the style (historical to contemporary) that can be linked to one's ancestors; examples will be illustrated and included in student portfolios o Research and recognize the architectural styles and materials associated with one's cultural background o View and identify various styles from a variety of historical to contemporary periods o Research and write a paper on a famous architect
C. Architectural Drawing (50-100 hrs) 1. Values of lines a. Architectural line conventions b. Expressive use of lines 2. Lettering styles c. Architectural lettering d. American national standard alphabet 3. Visual layout 4. Architectural symbols a. Types of symbols • Door and window symbols • Material symbols • Electrical symbols b. Purposes c. Applications	Pathway Standards A6.0 Students understand the use of computer-aided drafting and design (CADD) in developing architectural designs: A6.1 Know various CADD programs that are commonly used in architectural design. A6.2 Use CADD software to develop a preliminary architectural proposal. Foundation Standards 10.0 Technical Knowledge and Skills 10.2 Understand the importance of technical and computer-aided technologies essential to the language of the engineering and design industry. 10.3 Understand how to use, adjust, maintain, and troubleshoot the equipment and tools of the engineering and design industry in a safe, effective, and efficient manner.	o Practice sketching and hand-drafting exercises o Practice computer exercises from textbooks, workbooks, or on-line tutorials for design programs such as AutoCAD, Sketch Up, SolidWorks, Revit o Develop pictorial sketches in both isometric and perspective modes o Lay out and develop pictorial drawings using shading and shadowing techniques o Identify the basic types of material and symbols used in architectural drawings o Produce various computer aided architectural drawings and demonstrate proper plotting techniques o Review ANSI Standards (Architectural Drawing and Design Standards)
D. Design Concepts (50-100 hrs)	VPA Standards	o View presentations on various architects' work, identify

Course Outline	*Career Technical Education Standards*	*Suggested Activities/Assessment*
1. Client needs 2. Aesthetics a. Artistic perception b. Analysis and evaluation 3. Texts and design principles a. Balance b. Texture c. Proportion • Perceptual skills • Object and room size • Cost analysis d. Color harmonies • Color spectrum • Quality • Effects: tints and shades e. Space in our environment • Relationships with artistic perception • Aesthetic valuing f. Volume g. Shape and form • Square and cube • Architectural shapes, triangles, octagons, pentagons, circles, etc. • Vertical and horizontal shapes 4. Creativity a. Expression b. Aesthetic valuing	1.0 Artistic Perception Students perceive and respond to works of art, objects in nature, events, and the environment. They also use the vocabulary of the visual arts to express their observations. 1.1 Identify and use the principles of design to discuss, analyze, and write about visual aspects in the environment and in works of art/architecture, including their own. 1.2 Describe the principles of design as used in works of art/architecture, focusing on dominance and subordination. VPA Standards 2.0 Creative Expression Students apply artistic processes and skills, using a variety of media to communicate meaning and intent in original artworks. 2.1 Solve a visual arts problem that involves the effective use of the elements of art and the principles of design. 2.2 Prepare a portfolio of original two- and three-dimensional works of art that reflects refined craftsmanship and technical skills. 2.3 Develop and refine skill in the manipulation of digital imagery. 2.4 Review and refine observational drawing skills.	styles of interest and determine the characteristics that are unique to that style o Keep a journal that includes sketches of different architectural styles o View pictures of a variety of architectural styles and periods o Choose a period of architecture in the visual dictionary, identify styles in that period, and relate it to current styles o Identify various architectural styles within one's community or life experience o Discuss characteristics of various styles o Maintain a cumulative assignment that includes drawings in either pictorial or perspective mode, and incorporates various colors, shading, and symbols to complete a presen-tational drawing and layout of an architectural structure o In journals, analyze why certain colors were chosen to express a feeling or style and relate symbols to these colors; discuss the aesthetic value of the final product o Use the color wheel to demonstrate an understanding of color composition o Draw a design that shows understanding of depth dimension, shape, and structure in relation to objects o Draw a design that shows the importance of color and texture, and how they relate to objects or structures to create style o Use the visual elements of line, value, shape, form, color, and texture to create a project o Design a project demonstrating balance, rhythm, movement, variety, proportion, emphasis and unity o Perform the activities listed under the VPA Standards to the left
E. Area planning and Room Designs	VPA Standards	o Discuss the principles of aesthetics

Course Outline	*Career Technical Education Standards*	*Suggested Activities/Assessment*
(40-80 hrs) 1. Traffic patterns: 3-D computer spatial analysis a. Living area b. Sleeping areas c. Service areas 2. Space requirements a. Space in our environment • Interior creative expression • Exterior expression b. Space in 3-dimensional art/architecture 3. Furniture applications 4. Aesthetic valuing	4.0 Aesthetic Valuing Students analyze, assess, and derive meaning from works of art, including their own, according to the elements of art, the principles of design, and aesthetic qualities. 4.1 Articulate how personal beliefs, cultural traditions, and current social, economic, and political contexts influence the interpretation of the meaning or message in a work of art or architecture. 4.3 Formulate and support a position regarding the aesthetic value of a specific work of art/architecture and change or defend that position after considering the views of others. 4.4 Articulate the process and rationale for refining and reworking one of their own works of art/architecture. 4.5 Employ the conventions of art criticism in writing and speaking about works of art/architecture. Foundation Standards 5.0 Problem Solving and Critical Thinking Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques: 5.2 Understand the systematic problem-solving models that incorporate input, process, outcome, and feedback components. 5.3 Use critical thinking skills to make informed decisions and solve problems.	o Analyze samples of room designs; assess the layout of the rooms and the contents; explain the concepts and ideas behind the layout, furniture, styles, colors, textures and evaluate whether or not it is functional and aesthetically pleasing; does it portray the intended style or purpose needed o Assess one's own work as well as others in relation to layout and design o Interpret ideas being conveyed through style, color and texture, and relate this to individual feelings, needs or emotions o Design a residential room and floor plans that include proper room layout, utilizing architectural symbols, dimensions, notes, and schedules o Develop a portfolio of work as a tool for both preservation and presentation o Design a home • Complete two home designs, one-story and two-story, using architectural design software • Pick favorite home and plot it using project specifications • Create a 3D walkthrough animation • Add sound and title • Prepare front elevation, floor plan, and plot plan • Write essay describing why you designed your home o Perform the activities listed under the VPA Standards to the left
F. Architecture and Construction (10-20)	Pathway Standards	o Lecture and class discussion on architectural reference

Course Outline	*Career Technical Education Standards*	*Suggested Activities/Assessment*
1. Architectural reference data a. Product catalogs and manuals b. Building codes c. Building materials d. Building costs 2. Construction methods a. Construction techniques b. Building materials c. Building codes d. Building permits 3. Safety Codes 4. Green construction design 5. Architectural projects a. Students understand the theoretical, practical, and contextual issues that influence design b. Students understand the relationship between architecture and the external environment c. Students understand the mechanics and properties of structural materials d. Students understand how to systematically complete an architectural project e. Students understand the methods of creating both written and digital portfolios f. Students understand the effective use of architectural and structural equipment	A2.3 Use the necessary equipment for producing an architectural design and the appropriate methods and techniques for employing the equipment. A3.4 Develop a complete set of architectural plans and drawings. A4.3 Know the various components of structures, including lighting; heating, ventilating, and air-conditioning (HVAC); mechanical; electrical; plumbing; communication; security; and vertical transportation systems. A7.1 Develop, read, and understand architectural and construction plans, drawings, diagrams, and specifications. A7.2 Estimate the materials needed for a project by reading an architectural drawing. A8.1 Develop a binder of representative student work for presentation. A8.2 Produce a compact disc, Web site, or other digital-media portfolio. A8.3 Give an effective oral presentation of a portfolio. A9.3 Apply the concepts of architectural and structural engineering to the tools, equipment, projects, and procedures of the Architectural and Structural Engineering Pathway.	data, construction methods, building codes, and safety codes o Research green technology design resources at http://www.green-technology.org o Enter a competition, such as: • Annual high school design competition sponsored by the Architectural Foundation of San Francisco • Student Recognition Project sponsored by the San Ramon Valley Business and Education Rountable • High school competition sponsored by the Home Builders Association of Northern California o Perform the activities listed under Pathway Standards to the left
G. Career Path (10-20 hrs)	VPA Standards	o Research and explore pathways and careers in

Course Outline	*Career Technical Education Standards*	*Suggested Activities/Assessment*
1. Research and discuss career paths in the field of architectural design 2. Write resumes, applications, cover letters, and thank you letters 3. Practice interviewing techniques 4. Compile a portfolio of creative work 5. Discuss further education and training needed to be successful in this field 6. Discuss other skills and qualities valued on the job, including responsibility, flexibility, ethics, leadership, and teamwork.	5.0 Connections, Relationships, Applications Students apply what they learn in the visual arts across subject areas. They develop competencies and creative skills in problem solving, communication, and management of time and resources that contribute to lifelong learning and career skills. They also learn about careers in and related to the visual arts/architecture. Foundation Standards 3.0 Career Planning and Management Students understand how to make effective decisions, use career information, and manage personal career plans: 3.1 Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in a career. 3.2 Understand the scope of career opportunities and know the requirements for education, training, and licensure. 3.6 Know important strategies for self-promotion in the hiring process, such as job applications, résumé writing, interviewing skills, and preparation of a portfolio. Communications—Writing 2.5 Write job applications and résumés: • Provide clear and purposeful information and address the intended audience appropriately. • Follow the conventional style for that type of document (e.g., résumé, memorandum) and use page formats, fonts, and spacing that contribute to the readability and impact of the document.	architectural design, including further education and training needs o Invite guest speakers from the industry to discuss their chosen careers o Write a resume, cover letter, and thank-you letter o Organize portfolio o Take field trips to professional work environments o Practice interviewing techniques for a job or internship.
	Foundation Standards	

Course Outline	*Career Technical Education Standards*	*Suggested Activities/Assessment*
TOTAL HOURS 180 – 360 *(Note: Typical high school course equals 180 hours per year)*	7.0 Responsibility and Flexibility Students know the behaviors associated with the demonstration of responsibility and flexibility in personal, workplace, and community settings: 7.1 Understand the qualities and behaviors that constitute a positive and professional work demeanor. 7.3 Understand the need to adapt to varied roles and responsibilities. 8.0 Ethics and Legal Responsibilities Students understand professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms: 8.3 Understand the role of personal integrity and ethical behavior in the workplace. 9.0 Leadership and Teamwork Students understand effective leadership styles, key concepts of group dynamics, team and individual decision making, the benefits of workforce diversity, and conflict resolution: 9.1 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace settings. 9.3 Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.	

IV. METHODS, STRATEGIES AND TECHNIQUES

A variety of strategies and techniques are used to instruct the students, including:

- Direct instruction (lectures, demonstrations, small and large group discussion) and performance
- Use of a variety of instructional materials and resources (professional journals, reference materials, textbooks, electronic media)
- Project-based learning
- Use of community resources including guest speakers and field trips
- Design problems
- Simulations
- Peer coaching and student mentoring
- Group and individual projects
- Portfolio presentation
- Journal/notebook
- Group and individual projects
- Exhibitions, competitions, presentations
- Self-directed collaborative learning
- Visual presentation formats for design terminology
- Hands-on computer-based projects

V. ASSESSMENT OF STUDENT PERFORMANCE

Assessment of student performance will include but will not be limited to:

- Classroom participation and effort
- Mastery of skills and quality of work
- Completion of assignments/portfolio
- Individual projects/group projects
- Punctuality and attendance
- Self-assessment and peer-assessment critiques
- Embedded assessments
- ANSI Standards (Architectural Drawing and Design Standards)
- Tests, quizzes, final exam

VI. ROP CERTIFICATE REQUIREMENTS

To earn ROP certification for this course, the student must accomplish the following:

- Complete student performance objectives
- Maintain a **95%** attendance rate
- Demonstrate a positive work attitude

VII. ASSESSED JOB MARKET NEEDS

According to ONET, the online resource for the U.S. Dept. of Labor (2008), the field of architects is growing faster than average in the United States for the time period 2006-2016. In California, this growth is projected at 15%. The median wage for architects in California is $75,500. The field of architectural drafters is growing more slowly than average. In California, there are expected to be 520 job openings annually, with a median wage of $50,100.

The Occupational Outlook Handbook (2008-09) states “opportunities should be best for individuals with at least 2 years of postsecondary training in a drafting program that provides strong technical skills and considerable experience with CADD systems. CADD has increased the complexity of drafting applications while enhancing the productivity of drafters. It also has enhanced the nature of drafting by creating more possibilities for design and drafting. As technology continues to advance, employers will look for drafters with a strong background in fundamental drafting principles, a high level of technical sophistication, and the ability to apply their knowledge to a broader range of responsibilities.”

VIII. DEPARTMENTALLY APPROVED INSTRUCTIONAL MATERIALS AND EQUIPMENT

Teacher Resources:

Architecture Residential Drawing and Design; Clois E. Kicklighter, Goodheart-Willcox Co., Inc., 2008

AutoCAD and Its Applications, Shumaker, Madsen and Madsen, The Goodheart-Willcox company, 2007

Exercise Workbook for Beginning AutoCAD 2007, Cheryl R. Shrock, Industrial Press 2006

A History of Architecture; Spiro Kostof, Oxford University Press

Web sites:

http://architecture.about.com/

www.greatbuildings.com

http://green-technology.org/

Equipment:

Computer lab and Architectural Design software such as such as AutoCAD, Sketch Up, SolidWorks, Revit