Summer 2023

Systems Design

CRN 13530 CIS 43–61Z

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Preferred contact method: email

Questions via email: I will respond within 24 hours (longer on weekends or holidays)

Office Hours: Monday July 3 – August 7, 2023 12:00 noon–1:00 pm (Zoom meeting online)
https://fhda-edu.zoom.us/j/81997448513

Tuesday July 11 – August 8, 2023 4:00pm –5:00 pm (Zoom meeting online)
Note: No Office Hours on Tuesday, July 4 (holiday)
https://fhda-edu.zoom.us/j/84341767516

Other times by appointment (via Zoom meeting online)
Note: Nothing on campus.

Course delivery: Asynchronous online

Course repository: Canvas learning management system

LEARNING MATERIALS:

1. **TEXTBOOK:**
   a. Dennis, Alan; Wixom, Barbara Haley; and Roth, Roberta M. Systems Analysis and Design, Eighth edition. 2022. Wiley. Copies of this will be available in the De Anza Bookstore managed by Follett. There are options for eBook and rentals. See also the Wiley site.
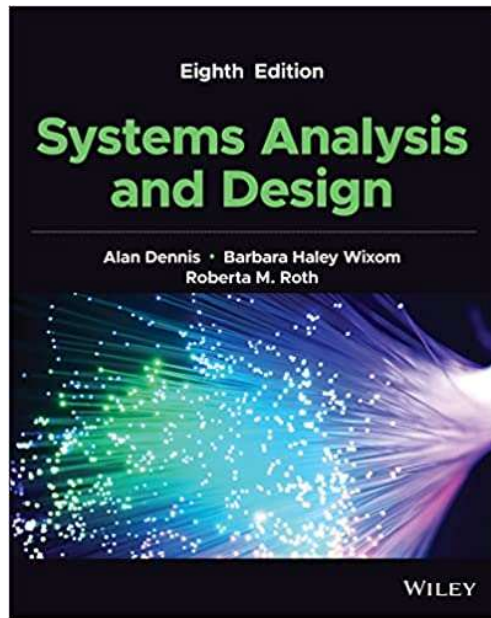
2. Supplemental materials (no cost):
   a. UML: OMG® Unified Modeling Language® (OMG UML®) Version 2.5.1, December 2017. https://www.omg.org/spec/UML/2.5.1/PDF
   b. SysML: download the latest version OMG SysML v. 1.6 [Dec 2019]. https://sysml.org/sysml-specs/
   c. Guide to the Systems Engineering Body of Knowledge (SEBoK), version 2.7. October 31, 2022. 1082 pages. https://sebokwiki.org/w/images/sebokwiki-farm!w/9/9d/Guide_to_the_Systems_Engineering_Body_of_Knowledge_v.2.7.pdf

3. Lecture materials are posted in the Canvas Learning Management System. Recordings of the lectures will be made available with captioning, with links to them posted in the Canvas Learning Management System.

STUDENT LEARNING OUTCOMES

1. Describe and communicate system types and the system development life cycle.
2. Analyze system requirements and evaluate proposed solutions.

OBJECTIVES

In this course, students will learn to:

- Describe system types and the system development life cycle.
- Analyze system requirements and evaluate proposed solutions.
- Implement structured design to create data flow diagrams, data structure/dictionaries, structure charts, HIPO charts, and VTOCs.
- Describe and evaluate a system design.

- Communicate problem specifications, alternative solutions, resultant design to both system designers and user.
- Examine prototyping, JAD, modeling tools, project management techniques, and CASE technologies.

ATTENDANCE

This is a 4.5-unit course with a 4-hour lecture component and a 1.5 hour lab component. Please follow the course calendar/plan in order to complete reading, quizzes, assignments, midterm examination, final examination, and other work on time.

In order not to be dropped as a "no-show" you must complete the introductory survey "Quiz 0" by Sunday, July 9, 2023. You will not be automatically dropped once you have completed the introductory survey assignment. Once you have completed the introductory survey, if you wish to drop the class, it is *your responsibility to drop the class before the deadline in the Schedule of Classes*. Otherwise, an appropriate grade will be assigned at the end of the quarter.

Scholarly Conduct

Discussion and exchange of ideas on assignments are strongly encouraged. However, each person is expected to complete his/her own work. Identical solutions will be given a zero grade.

Copying or cheating during an exam will result in a zero being assigned to all the parties involved.

ASSIGNMENTS

The assignments measure your ability to apply course concepts to hands-on skills by using commonly used software.

INCOMPLETE

No Incomplete for Assignments - Keep up with Assignments and turn in whatever you have at the end of the quarter. Incompletes will only be granted for justifiable reasons for work not finished and 10% may be deducted from the assignment score.

ALL EXAMS ARE MANDATORY

MIDTERM EXAM One midterm will be given during the quarter covering course terms and concepts during the first half of the course. There are usually 40 - 50 questions, mostly multiple choice, True/False, and perhaps with some fill-in the blanks. There may also be short "essay" questions. It will be held in Week 4 (starting between Thursday, July 27 8am California time and completed by Friday, July 28 11:59pm California time).

FINAL EXAM The final exam will be administered at the end of the quarter (Week 6, starting between Thursday, August 10 8am California time and completed by Friday, August 11 11:59pm California time). It will be a comprehensive exam, covering the entire course. There are usually on the order of 50 questions.

POINTS The following points can be obtained for various course activities:

ACTIVITY	Information	Weight/Points
Quizzes	Around 10, approximately weekly (in Canvas)	100
Midterm Exam	40-50 questions (in Canvas)	100
Assignments	Turned in as assigned (in Canvas)	100
Final Exam	~50 questions (in Canvas)	100
Total Points		400

SCORING/GRADES:

Your total score will be normalized to 100 and indexed into the grading scale below:

98%+=A+, 92-97=A, 90-91=A-, 88-89=B+, 82-87=B, 80-81=B-, 78-79=C+, 70-77=C, 60-69=D, <60=F

Percentages are rounded to the nearest whole number.

Posting Grades At the end of the quarter you can view your grade in the course via MyPortal.

Course Plan (Summer 2023)

The weekly reading assignments are shown for the textbook.

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 1, Part 1	7/3/2023	7/9/2023	Course Introduction; System Analysis and Design Basics
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 1 The Systems Analyst and Information System Development, pages 3-31.
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 13 Agile Development Methods, pages 418-437.
			LECTURE 1: Introduction
			Introduction; Course Outline/Plan, Syllabus; Context in the De Anza CIS curriculum (Business Programming certificate, etc.)
			LECTURE 2: Definitions and basics
			Definition of system, system analysis, system analyst, system design, system types
			Establishing scope: what systems will we cover in the course (information technology systems, information systems)
			LECTURE 3: Systems Development Life Cycle (SDLC)
			Systems Development Life Cycle (SDLC): varies by textbook author (e.g., Planning, Analysis, Design, Implementation)
			LECTURE 4: Systems Development Methodologies
			What is a Development Methodology?
			Structured Design: Waterfall, Parallel Development
			Rapid Application Development (RAD): Phased/incremental, Prototyping.
			Agile, Agile team roles
			RUP Unified Process
			Which methodology to use? Clarity of requirements; technology, system complexity, Reliability, Timelines
			Selecting a Methodology: Waterfall, Agile, Spiral, Hybrid
			Lab Assignment "0": Ensure you have access to a drawing program (for example, Microsoft Visio).
			See instructions for downloading a free version of Microsoft Visio (for Windows PCs).
			Quiz #0: Short essay/questionnaire on your system design background (no pressure, does not require the textbook or listening to any lecture material)
			Quiz #1: Covering Week 1, Part 1 lecture material (you do not need the textbook for this, recognizing that you may not have received it yet)

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 1, Part 2	**7/3/2023**	**7/9/2023**	**Project Management**
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 2 Project Selection and Management, pages 37-65.
			LECTURE 1: Introduction to Project Management
			Summary of classes in the De Anza project management program (for those interested in further study)
			Why are we covering project management?
			What is a project? Project Management Institute definition
			How organizations select which projects to pursue
			Needs Assessment: assess the internal and external environments, organizational capability and capacity, determine viable options
			Identify business problem or opportunity to pursue: elicit information, create "situation statement"
			...Tools: Benchmarking, competitive analysis, document analysis, interviews, market analysis, prototyping
			Assess the current state: analyze causes/reasons for a problem/opportunity
			...Evaluate organizational capabilities: Capability framework; Capability table, SWOT analysis
			...Look at organizational goals and objectives to ensure alignment
			...Analyze problem and root causes in order to address the business need.
			Project identification, initiation, and feasibility analysis
			Determine viable options, make recommendation
			"System Request"
			Feasibility Analysis: Technical, Economic, Organizational feasibility
			Decision Analysis: use of decision tree
			Economic feasibility: Return on Investment (ROI), Net Present Value (NPV), Benefit Cost Ratio, Internal Rate of Return (IRR), Payback Period
			Disciplines: Project management, requirements engineering, design/development, testing
			Product Life cycle versus a project life cycle versus Systems Development Life Cycle
			...Project Life Cycle Phases: Concept, Planning/Spec, Design/Develop, Test, Release to GA
			...Product Life Cycle
			LECTURE 2: Project Management Essential Concepts
			Work Breakdown Structure
			Creating the project schedule: Sequencing tasks; Estimating task resources, durations, and costs
			Allocating resources: people, equipment
			Critical path
			LECTURE 3: Project Management-Budget
			Creating and managing the project budget
			Managing risks
			Project manager's triangle
			LECTURE 4: Project Management-Risk Management
			Definitions of risk, risk appetite, risk attitude, risk threshold
			Individual and organizational risk types (risk-averse, risk-taking)
			Managing risks, risk strategies
			Assignment #1: Calculate the critical path for a project.
			Quiz #2: Covering Week 1, Part 2 lecture material (you do not need the textbook for this, recognizing that you may not have received it yet)

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 2, Part 1	**7/10/2023**	**7/16/2023**	**SDLC Analysis: Determining Requirements and Managing Requirements**
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 3 Requirements Determination, pages 71-107.
			LECTURE 1: Overview of Requirements
			Definition of a requirement. Agile epic, user story.
			Types of requirements: business, stakeholder, solution, transition; project and quality; functional & non-functional
			Product requirement versus project requirement
			Kano model
			LECTURE 2: Requirements Elicitation (aka Requirements Gathering)
			Determine elicitation approach: what information is needed; how to conduct elicitation; which stakeholders; tools/techniques
			Techniques: Interviews, Questionnaires, Document Analysis, Observation
			Prepare for elicitation: objective, participants, questions to ask, agenda, schedule meeting
			Conduct elicitation: brainstorming, collaborative games, workshops, focus groups, interviews, prototyping, questionnaires/surveys
			Joint Application Development for requirements (JAD).
			Customer Visit: A focused meeting on gathering customer requirements: not a sales call.
			Confirm elicitation results: confirm accuracy, achieve common understanding
			LECTURE 3: Select and Approve Requirements
			Define scope: narrowing the list of requirements to those that will be implemented; Establishing the requirements baseline
			Constraints: resources, cost, time
			Use a product roadmap or story map to show how requirements will be implemented over a period of time
			Tools for deciding which requirements to include
			Prioritizing requirements
			Purpose Alignment Model: placing product features in a matrix according to their criticality and market differentiation to support decision making
			LECTURE 4: Requirement Traceability
			Determine Traceability (bi-directional: forward and backward) and Monitoring Approach (change management). Adhere to compliance/regulatory standards
			...Forward traceability: requirements->design-> test->product
			...Backward traceability: Requirements-> scope-> business goals and objectives
			Establish Relationships and Dependencies
			...Linkages between requirements; ensure adding business value, meet customer needs
			...Requirement subsets; implementation dependencies; benefit dependency
			...Tools: feature model, story mapping, story slicing, traceability matrix
			Gold-plating
			Assignment #2: An exercise in crafting requirements for a project.
			Quiz #3 covering Week 2, Part 1 lecture material

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 2, Part 2	7/10/2023	7/16/2023	ANALYSIS MODELING: Modeling Business Processes, Modeling Functionality
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 4 Understanding Processes with Use Cases and Process Models, pages 111-162.
			LECTURE 1: Overview of Modeling
			Definition of model
			Modeling frameworks, languages (BPMN, SysML, UML)
			Modeling stages
			Types of models (Scope, Process, Rule, Data, Interface)
			Business Process Modeling Notation (BPMN) overview and examples
			LECTURE 2: Modeling with SysML and UML
			SysML (System Modeling Language)
			UML (Unified Modeling Language)
			LECTURE 3: Use Cases and Use Case Diagrams
			Identifying the important (major) system use cases
			What is in a Use Case Diagram? How to Create a Use Case Diagram
			Use Case Description; How to Create a Use Case Description
			Use Case template: Use case name; Actor; Description; Trigger; Preconditions; Normal Course; Postconditions; alternative flows (exceptions)
			Types of Use cases
			LECTURE 4: Modeling with Activity Diagrams
			What is an Activity Diagram?
			Elements of an Activity Diagram
			How to Create an Activity Diagram
			Using walkthroughs to validate the diagrams (functional model verification and validation)
			LECTURE 5: Process Modeling with Data Flow Diagrams
			What is a Data Flow Diagram (DFD)?
			DFD Diagram Hierarchy (Context Diagram is top level)
			DFD elements, symbols, and components
			DFD balancing
			Assignment #3: Create a Data Flow Diagram.
			Quiz #4 covering Week 2, Part 2 lecture material

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 3, Part 1	7/17/2023	7/23/2023	Data Modeling, Structural Modeling, and Behavioral Modeling
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 5 Data Modeling, pages 169-200.
			LECTURE 1: Data Modeling with Entity Relationship Diagrams
			What is an Entity Relationship Diagram (ERD)?
			Elements (entity, attribute, relationship) and symbols. Cardinality, modality.
			Building an ERD: Identify entities, Add Attributes, Identify entity relationships
			ERD Normalization
			Balancing ERD and DFD
			CRUD (Create, Read, Update, Delete) matrix
			LECTURE 2: Introduction to Structural Models
			What is a Structural Model?
			Classes, attributes, operations, object identification
			Generalization, Aggregation, Association, Polymorphism
			Structure charts. Afferent, Central, and Efferent processes.
			LECTURE 3: Modeling with CRC Cards and Class Diagrams
			What are CRC Cards?
			What are Class Diagrams?
			LECTURE 4: Behavior modeling
			Behavior Models
			Interaction Diagrams: Objects, Operations, Messages; Sequence Diagrams; Communications Diagrams
			States, Events, Transitions, Actions, Activities
			What is in a Behavioral State Machine?
			Creating a Behavioral State Machine
			Assignment #4: Create an ERD.
			Quiz #5

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 3, Part 2	7/17/2023	7/23/2023	Design Phase Strategies and Modeling
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 6 Moving into Design, pages 203-220.
			LECTURE 1: Design Strategies
			Transition from Analysis to Design
			Ways to construct the system:
			(1) Custom in-house development (make)
			(2) Acquiring third party solutions (buy)
			(3) Outsourcing the work
			Alternative Matrix (Decision matrix); Weighted alternative matrix
			Determine the appropriate design strategy
			LECTURE 2: Balancing Models; Transforming Analysis Models to Design Models
			Balancing (ensuring consistency of, verifying/validating) Functional-Structural models
			Balancing Functional-Behavioral models
			Balancing Structural-Behavioral models
			Evolving Analysis Models to Design Models: Factoring, Partitions, Layers
			LECTURE 3: Package Diagrams
			Guidelines
			Creating a Package Diagram
			Assignment #5: Using a weighted alternative matrix.
			Quiz #6

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 4, Part 1	7/24/2023	7/30/2023	Physical Architecture Layer Design
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 7 Architecture Design, pages 222-247.
			LECTURE 1: Design Thinking, Systems Thinking
			Design Thinking
			Systems Thinking
			LECTURE 2: Architecture Overview
			Architectural Components (hardware, software)
			Types of architectures (Client-server, Server-based, mobile, etc.)
			Virtualization
			Cloud Computing
			Containerization, Kubernetes
			LECTURE 3: Specifications, Non-functional requirements/Quality
			Non-functional requirements/Quality considerations
			Hardware and Software specifications
			LECTURE 4: Review for the Midterm
			Quick run through of content of the midterm, quickly reviewing key concepts that have been covered
			Assignment #6: Making system architecture choices.
			No quiz this week (due to the midterm)
			Midterm. Tentatively between Thursday, July 27 8am through Friday, July 28 11:59pm.

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 4, Part 2	7/24/2023	7/30/2023	Human to Computer Interaction Layer Design Concepts
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 8 User Interface Design, pages 250-295.
			LECTURE 1: User Interface Design Overview
			Layout
			Content awareness
			Aesthetics
			User Experience
			Consistency
			LECTURE 2: User Interface design process
			Use scenarios
			Structure, Standards
			Prototyping
			Visual Table of Contents (VTOC)
			LECTURE 3: Navigation, Design of Input, Design of Output
			Input principles
			Output principles
			Non-functional requirements
			Assignment #7: Create the user interface for a simple application.
			Quiz #7

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 5, Part 1	7/31/2023	8/6/2023	Program Design
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 9 Program Design, pages 300-330.
			LECTURE 1: Moving from Logical to Physical Process Models
			Moving from Logical to Physical Process Models
			Physical Data Flow Diagram (DFD)
			Modularity
			LECTURE 2: Structure Charts
			Hierarchical format: sequence of invocation, selection (conditions for module invocation), iteration (repetition)
			Control module, subordinate modules, library modules
			Data couples, control couples
			Afferent processes (inputs), central processes (operational processes), efferent processes (outputs)
			Transaction structure; Transform structure
			LECTURE 3: Design Criteria, Design Guidelines
			Coupling
			Cohesion
			Factoring
			Connascence
			Design activities: specifications, reuse, optimization
			Constraints, Contracts
			Method specification: events, message-passing, algorithms
			Assignment #8: Design a simple application.
			Quiz #8

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 5, Part 2	7/31/2023	8/6/2023	Data Storage Design
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 10 Data Storage Design, pages 336-364.
			LECTURE 1A: Data Storage formats
			Files, databases
			Databases: hierarchical, relational, multi-dimensional
			Object-Relational Databases
			Object-oriented databases
			LECTURE 1B: Moving to a Physical ERD
			Physical ERD
			Updating the CRUD matrix
			LECTURE 2: Mapping domain objects to a storage format
			Designing data access, data manipulation
			LECTURE 3: Non-functional requirements in data storage design
			Performance (storage efficiency, speed of access)
			Storage efficiency: Normalization
			Access Speed: Denormalization, clustering, indexing
			Estimating storage size
			Assignment #9: Data Storage Design for a simple application.
			Quiz #9

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 6, Part 1	8/7/2023	8/11/2023	Implementation
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 11 Moving Into Implementation, pages 369-389.
			LECTURE 1: Implementation
			Managing the development effort
			The Mythical Man-month
			On-going project management, managing scope creep, change control
			DevOps, Continuous Development and Delivery
			Remember the context (System Development Life Cycle): Development before generating test cases, or Creating the test cases and then developing
			LECTURE 2: Testing
			Unit testing, Integration testing, System Testing; Regression testing; Automated testing; Acceptance testing
			Alpha Testing
			Beta Testing (production environment or limited exposure)
			LECTURE 3: Documentation
			Documentation: System documentation; user documentation
			Hierarchical Input Process Output (HIPO) chart
			Assignment #10: Prepare the user documentation for a simple application.
			No Quiz this week (we have had ten quizzes, Quizzes 0 through 9)

Week	WEEK STARTING DATE (Mon)	WEEK ENDING DATE (Sun)	ACTIVITIES/ASSIGNMENTS
Week 6, Part 2	8/7/2023	8/9/2023	Rollout and post-rollout
			Reading Assignment: Systems Analysis and Design, 8th edition, Chapter 12 Transition to the New System, pages 391-415.
			LECTURE 1: Rollout (Installation, Operations)
			First Customer Shipment, First Revenue Shipment
			Limited Availability, General Availability (all sales regions, etc.)
			Migration, Conversion
			Training; Transfer of Information (TOI) to support and sales organizations
			LECTURE 2: Change Management
			Resistance to change and overcoming it (John Kotter's model)
			Support, Maintenance, Sustaining Engineering (Level 1-3)
			Project assessment, lessons learned
			LECTURE 3: Review of course material in preparation for the final.
			Comprehensive review for the final (review of several hundred slides).
			Assignment: No assignment this week, other than studying for the final exam.
			No Quiz this week due to the final exam.
			Final Exam. Tentatively between Thursday, August 10 8am through Friday, August 11 11:59pm.
			End of course survey

Important Dates (Academic Calendar Summer 2023 downloaded 6/22/2023)

http://www.deanza.edu/calendar/

Academic Calendar (deanza.edu)

https://www.deanza.edu/calendar/index.html

APRIL 1	Application for admission open
APRIL 25	View schedule of classes for summer 2023
MAY 15	Registration opens based on Priority Registration group
MAY 15	Group 1 registration opens
MAY 17	Group 2 registration opens
MAY 18	Group 3 registration opens
MAY 19	Group 4 registration opens
MAY 22	Group 5 registration opens
MAY 23	Group 6 registration opens
MAY 24	Group 7 registration opens
MAY 25	Group 8 registration opens
JULY 3	First day of Summer Session
JULY 4	Independence Day holiday - no classes; offices closed
SEPTEMBER 2-4	Labor Day Holiday – no classes; offices closed

Help and Support

Disability Accommodations:
De Anza College views disability as an important aspect of diversity, and is committed to providing equitable access to learning opportunities for all students.

Disability Support Services (DSS) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations If you have, or think you have, a disability in any area such as, mental health, attention, learning, chronic health, sensory, or physical,

please contact DSS to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with DSS and have accommodations set by a DSS counselor, please be sure that your instructor has received your accommodation letter from Clockwork early in the quarter to review how the accommodations will be applied in the course. Students who need accommodated test proctoring must meet appointment booking deadlines at the Testing Center. a) Midterm exam be booked at least five (5) business days in advance of the instructor approved exam date/time. b) Final exams must be scheduled seven (7) business days/weekdays in advance of the instructor approved exam date/time. Failure to meet appointment booking deadlines will result in the forfeit of testing accommodations and you will be required to take your exam with the class.

DSS Location: RSS Building, Suite 141 http://www.deanza.edu/DSS/ Phone: 408-864-8753 Email: DSS@deanza.edu

Student Success Center:

Need help? Meet with tutors and attend workshops in the Student Success Center: www.deanza.edu/studentsuccess. **Can't make it to campus?** Use the free online tutoring available to all De Anza students. Just login to MyPortal, go to the Students tab, and find the Smarthinking link.