

De Anza College

Course Outline of Record Report

10/02/2025

CISD017B : Foundations of Machine Learning

General Information

Faculty Initiator:	- Clare Nguyen - Pape, Mary
Attachments:	UCTransferable_CIS_17B_2026F.pdf Hybrid_CIS_17B_2026F.pdf Online_CIS_17B_2026F.pdf ReqAdv_G_CIS_17B_2026F_1.pdf ReqAdv_G_CIS_17B_2026F_2.pdf
Course ID (CB01A and CB01B) :	CISD017B
Short Course Title:	FOUNDATIONS MACHINE LEARNING
Course Title (CB02) :	Foundations of Machine Learning
Department:	CIS - Computer Sci and Info Systems
Effective Term:	Fall 2026
TOP Code (CB03) :	(0799.00) *Other Information Technology
CIP Code:	(11.9999) Computer and Information Sciences and Support Services, Other.
SAM Priority Code (CB09) :	C - Clearly Occupational
Distance Education Approved:	Yes
Course Control Number:	No value
Curriculum Committee Approval Date:	06/17/2025
Board of Trustees Approval Date:	Pending
External Review Approval Date:	09/01/2026
Course Description:	This course utilizes the student's experience with the Python programming language and machine learning concepts to identify and analyze mathematical and statistical techniques that are the foundation of machine learning (ML) and artificial intelligence (AI) algorithms. Through programming and machine learning libraries, students will gain a mathematical understanding of machine learning algorithms.
Course Type (CB27) :	Lower Division
Mode of Delivery:	- Online - Hybrid
Faculty Initiator:	No value
Course Family:	Not Applicable

Faculty Requirements

Discipline 1:	Computer Science
Discipline 2:	No value

Discipline 3:

No value

FSA:

- FHDA FSA - COMPUTER SCIENCE

Formerly Statement

Formerly Statement

No Value

Course Justification

Course Justification

This is a UC/CSU transferable course. It is CTE and belongs in the Certificate of Achievement - Advanced in Applied Artificial Intelligence. This course will provide students with foundational knowledge and application of math and statistics in machine learning models.

Stand-Alone Statement

Stand-Alone Statement

No Value

Course Philosophy

Course Philosophy

No Value

CTE Course

Is this a CTE (Career Technical Education) course?

Yes

Honors/Non-honors Course

Is this an honors/non-honors course?

No

Mirrored Credit/Noncredit Course

Is this a mirrored credit/noncredit course?
No

Cross-listed Course

Is this a cross-listed course?
No

Foothill Equivalency

Does the course have a Foothill equivalent?
No

Foothill Faculty Consultation Name
No Value

Foothill Course ID
No Value

Course Development Options

Basic Skill Status (CB08)
Course is not a basic skills course.

Course Special Class Status (CB13)
Course is not a special class.

Grade Options

- Letter Grade
- Pass/No Pass

Repeat Limit
0

Course Prior To College Level
Not applicable.

Repeatability Statement
No value

Course Support Status (CB26)
Course is not a support course

Associated Programs

☒ Course is part of a program

Associated Program	Award Type	Active
Applied Artificial Intelligence Associate of Science (In Development)	Associate in Science (A.S.) Degree	Fall 2026

Applied Artificial Intelligence Certificate of Achievement - Advanced (In Development)	Certificate of Achievement-Advanced (COA-A)	Fall 2026
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Transferability & Gen. Ed. Options

Course General Education Status (CB25)

Y

Transferability (CB05)

Transferable to both UC and CSU

Transferability Status

Pending

UC Transferable and/or Lower-Division Major Requirement

Will the course be UC transferable?

Yes

If yes, identify the lower-division UC course and campus.

UC Santa Cruz CSE 40: Machine Learning Basics: Data Analysis and Empirical Methods

Will the course fulfill a UC/CSU lower-division major requirement?

No

If yes, identify the UC/CSU campus, course and major.

No Value

Units and Hours

Summary

Minimum Credit Units	4.5
Maximum Credit Units	4.5
Total Course In-Class (Contact) Hours	66
Total Course Out-of-Class Hours	96
Total Student Learning Hours	162

Credit / Non-Credit Options

Specifications	
Methods of Instruction	
Methods of Instruction	Methods of Instruction
Methods of Instruction	Collaborative learning and small group exercises Collaborative projects Discussion and problem-solving performed in class Discussion of assigned reading Homework and extended projects

In-class exploration of internet sites
Laboratory discussion sessions and quizzes that evaluate the proceedings weekly laboratory exercises
Lecture and visual aids
Quiz and examination review performed in class

- Assignments
- A. Reading in textbook, online references, and lecture notes.

B. 6-8 problem solving assignments on identifying, applying, and evaluating math and statistics concepts in machine learning models, covering the Lab Topics specified in the Lab Outline section.

Methods of Evaluation	Methods of Evaluation
Methods of Evaluation	A. Assignments and quizzes are evaluated for completeness, correctness, and proper application of math and statistics concepts in machine learning models. B. In-class problem solving and group collaborative problem solving are evaluated for the ability to apply math and statistics concepts appropriately in machine learning models. C. One or more examinations with questions on math and statistics concepts in machine learning as discussed in class. Submitted work will be graded on correctness and completeness. D. A comprehensive final examinations with questions on math and statistics concepts in machine learning as discussed in class. Submitted work will be graded on correctness and completeness.

- Essential Student Materials/Essential College Facilities
- Essential Student Material:

• None
- Essential College Facilities:

• None

Examples of Primary Texts and References				
Author	Title	Publisher	Date/Edition	ISBN
Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Jonathan Taylor	Introduction to Statistical Learning	Springer	June 2023, 1st Edition	978-3-031-38747-0

Suggested Reading List

No Value

Learning Outcomes

Course Objectives		
Apply Linear Algebra and Calculus in Machine Learning (ML) Optimization		
Investigate Statistical Learning		
Examine Statistical Learning in Regression Models		
Examine Statistical Learning in Classification Models		
Examine Statistical Learning in Decision Tree Models		
Examine Statistical Learning in Support Vector Machines		
Examine Statistical Learning in Unsupervised Learning		
CSLOs		
Explain statistics, calculus, and linear algebra concepts in machine learning.	Expected SLO Performance: 0.0	
Describe and implement machine learning approaches in supervised and unsupervised learning.	Expected SLO Performance: 0.0	

Outline
Course Outline A. Apply Linear Algebra and Calculus in Machine Learning (ML) Optimization 1. Vector and matrix operations 2. Determinants and eigenvectors in dimensionality reduction 3. Derivatives, product rule, chain rule 4. Multivariate chain rule in neural networks 5. Convex and non-convex functions in optimizing ML models 6. Gradient descent in training ML models B. Investigate Statistical Learning 1. Probability space, discrete and continuous probabilities 2. Sum rule, product rule, Bayes’ theorem 3. Summary statistics on datasets: mean, median, mode, variance 4. Distributions, covariance 5. Conditional probability, estimation in ML decision making 6. Correlation, causation, conditional independence in machine learning 7. Confounding variable in ML model accuracy C. Examine Statistical Learning in Regression Models 1. Simple and multiple linear regression 2. K nearest neighbor vs linear regression

- D. Examine Statistical Learning in Classification Models
 - 1. Simple and Multiple Logistic regression
 - 2. Naïve Bayes
 - 3. K nearest neighbor
- E. Examine Statistical Learning in Decision Tree Models
 - 1. Regression tree
 - 2. Classification tree
 - 3. Random Forest
- F. Examine Statistical Learning in Support Vector Machines
 - 1. Support vector classifier
 - 2. Support vector machine
- G. Examine Statistical Learning in Unsupervised Learning
 - 1. Principal Component Analysis
 - 2. Clustering

Lab Outline

- A. Write code to analyze and solve math problems with vector and matrix operations, determinants and eigenvectors, derivatives and gradient descent
- B. Write code to analyze and solve probability and statistics problems in machine learning.
- C. Write code to analyze and visualize the algorithm of regression models.
- D. Write code to analyze and visualize the algorithm of classification models.
- E. Write code to analyze and visualize the algorithm of decision tree models.
- F. Write code to analyze and visualize the algorithm of support vector machines.
- G. Write code to analyze and visualize the algorithm of unsupervised models.

Blue Form

For changes to the units and hours tab; 1) Contact the Curriculum Office at curriculum@fhda.edu with the course information changes; and 2) address items 1-3 below. Please be aware that load factors and seat counts are assigned based on established, negotiated values.

No Value

1. Is the unit(s) change required for articulation?

No Value

2. If the course is UC or CSU transferable, identify one UC or CSU campus with the same unit value requested and copy and paste the catalog description of the course.

No Value

3. Identify the areas in the course outline of record that justify the unit(s) and/or hour(s) change.

No Value

Office Use ONLY: For a REVISION, state the existing unit(s); lec hour(s) and load; lab hour(s) and load; and seat count.

No Value

Office Use ONLY: For a REVISION, state the new unit(s); lec hour(s) and load; lab hour(s) and load; and seat count.

No Value

Office Use ONLY: For NEW, state the unit(s); lec hour(s) and load; lab hour(s) and load; and seat count.

- Units: 4.5
- Lec Hrs: 4
- Lec Load: .089
- Lab Hrs: 1.5
- Lab Load: .024
- Total Load: .113
- Seat Ct: 40
- (mkct 5/22/25)

Req/Adv

Prerequisite(s):

CIS D017A and MATH D001C (or MATH D01CH)

Corequisite(s):

No Value

Advisory(ies):

No Value

Advisory(ies) - Other:

No Value

Limitation(s) on Enrollment:

No Value

Limitation(s) on Enrollment - Other:

No Value

Entrance Skills(s):

No Value

Entrance Skill(s) - Other:

No Value

General Course Statement(s):

No Value

General Course Statement(s) - Other:

No Value

A-Matrix Form

EWRT D001A or EWRT D01AH or ESL D005. If this is the requisite for the course, complete the objective(s) below. If this requisite is being removed, provide an explanation as to why.

No Value

Objective 1: Analyze college level texts and discourse that are culturally and rhetorically diverse.

No Value

Objective 2: Compose essays drawn from personal experience and assigned texts.

No Value

Objective 3: Utilize MLA guidelines to format essays, cite sources, and compile a works cited page.

No Value

Objective 4: Create syntactically varied sentences that are free of mechanical errors.

No Value

Objective 5: Distinguish, compare, and evaluate the multiplicity and ambiguity of perspectives.

No Value

B-Matrix Form

ESL D272. and ESL D273., or ESL D472. and ESL D473., or eligibility for EWRT D001A or EWRT D01AH or ESL D005. If this is the requisite for the course, complete the objective(s) below. If this requisite is being removed, provide an explanation as to why.

No Value

Objective 1: Analyze a variety of college-level texts with a focus predominantly on expository and argumentative writing.

No Value

Objective 2: Develop analytical ideas and topics for essays.

No Value

Objective 3: Compose and support thesis statements for analytical essays.

No Value

Objective 4: Develop clear sequential relationship between central argument/controlling idea and supporting ideas in writing.

No Value

Objective 5: Identify and practice writing for different audiences and purposes.

No Value

Objective 6: Develop and demonstrate a variety of rhetorical strategies to develop strong analysis in essays.

No Value

Objective 7: Demonstrate writing as a multi-step process including attention to planning and revision.

No Value

Objective 8: Practice composing organized, developed, analytical essays that increase in complexity.

No Value

Objective 9: Demonstrate appropriate grammar usage and mechanics.

No Value

C-Matrix Form

ESL D261. and ESL D265., or ESL D461. and ESL D465., or eligibility for EWRT D001A or EWRT D01AH or ESL D005. If this is the requisite for the course, complete the objective(s) below. If this requisite is being removed, provide an explanation as to why.

No Value

Objective 1: Create compositions about fiction and non-fiction texts from many cultural and social perspectives in a variety of genres.

No Value

Objective 2: Compose a focused, purposeful, developed paper of 500 words or more that engages with, responds to, or is inspired by written or visual texts.

No Value

Objective 3: Produce written work using a cyclical process of multiples drafts and revisions.

No Value

Objective 4: Demonstrate the ability to include a variety of sentence structures in writing.

No Value

Objective 5: Edit compositions to correct errors in the major conventions of Standard Written English.

No Value

D-Matrix Form

Intermediate algebra or equivalent (or higher), or appropriate placement beyond intermediate algebra. If this is the requisite for the course, complete the objective(s) below. If this requisite is being removed, provide an explanation as to why.

No Value

Objective 1: Plan, implement, and assess work cycles, at the problem, lesson, module, and course level, to develop self-efficacy through the practice of self-regulated learning.

No Value

Objective 2: Investigate the use of mathematics in real world.

No Value

Objective 3: Explore functions.

No Value

Objective 4: Develop linear function models.

No Value

Objective 5: Use systems of two linear equations to solve real world problems.

No Value

Objective 6: Use linear inequalities in one variable to solve real world problems.

No Value

Objective 7: Examine exponential expressions and develop exponential function models.

No Value

Objective 8: Examine logarithmic expressions and develop logarithmic function models.

No Value

Objective 9: Develop quadratic function models to solve problems.

No Value

Objective 10: Investigate the characteristics of rational expressions.

No Value

Objective 11: Develop skills to work with radical expressions.

No Value

E-Matrix Form

Elementary algebra or equivalent (or higher), or appropriate placement beyond elementary algebra. If this is the requisite for the course, complete the objective(s) below. If this requisite is being removed, provide an explanation as to why.

No Value

Objective 1: Develop, throughout the course as applicable, systematic problem-solving methods.

No Value

Objective 2: Explore the function concept algebraically, numerically, verbally and graphically.

No Value

Objective 3: Explore the graphical and numerical characteristics of linear relationships and describe their meaning in the context of a problem.

No Value

Objective 4: Develop linear function models to solve problems.

No Value

Objective 5: Use systems of two linear equations to solve real-world problems.

No Value

Objective 6: Explore the graphical and numerical characteristics of quadratic relationships and describe their meaning in the context of a problem.

No Value

Objective 7: Develop quadratic function models to solve problems.

No Value

Objective 8: Use inequalities to solve real world problems.

No Value

Objective 9: Explore arithmetic sequences and series.

No Value

Objective 10: Investigate, throughout the course as applicable, how mathematics has developed as a human activity around the world.

No Value

F-Matrix Form

Pre-algebra or equivalent (or higher), or appropriate placement beyond pre-algebra. If this is the requisite for the course, complete the objective(s) below. If this requisite is being removed, provide an explanation as to why.

No Value

Objective 1: Develop, throughout the course as applicable, systematic problem solving methods.

No Value

Objective 2: Solve problems involving arithmetic operations, including fractions, percents and decimals.

No Value

Objective 3: Apply the order of operations to evaluate signed numerical expressions.

No Value

Objective 4: Solve problems involving operations with signed numbers.

No Value

Objective 5: Explore the characteristics and properties of real numbers.

No Value

Objective 6: Use estimation to determine approximate solutions and to check the reasonableness of answers.

No Value

Objective 7: Explore rates and ratios and use proportions to solve problems.

No Value

Objective 8: Explore, as applicable throughout the course, the geometry of mathematical measurements and solve problems involving geometric figures and formulas.

No Value

Objective 9: Explore the use of variables in expressions and evaluate algebraic expressions.

No Value

Objective 10: Solve linear equations in one variable numerically and algebraically.

No Value

Objective 11: Graph linear relationships on a Cartesian coordinate by plotting ordered pairs.

No Value

Objective 12: Investigate, throughout the course as applicable, how mathematics has developed as a human activity around the world.

No Value

G-Matrix Form

If the requisite does not fall under an A-F Matrix and is being removed, provide an explanation as to why.

No Value

If the requisite does not fall under an A-F Matrix and is being retained/added, download the Content Review Matrix G from the Reference Materials, and follow the remaining instructions on the form. Reminder that: an "OR" conjunction statement requires ONE representative G-Matrix; an "AND" conjunction statement requires a separate G-Matrix for EACH course.

No Value

H-Matrix Form

Objective 1: For entrance into a CTE program such as Nursing, AUTO, APRN, etc... list the prerequisite(s) to participate in the program.

No Value

Objective 2: For Student Cohorts, such as Honors, Puente, performance groups, intercollegiate teams, Special Projects course, etc... list the prerequisite(s) to participate in the cohort.

No Value

Objective 3: For Prerequisites based on Government/Licensing/Certification Regulations, or legal requirements, cite the regulation that mandates a prerequisite or attach a copy of it to this form.

No Value

Objective 4: For Requirements based on Health and Safety, describe the specific skills, concepts, and information without which the students would create a hazard to themselves or those around them. Also describe how students will meet those skills.

No Value

Objective 5: For Entrance Skills that are necessary for taking the course, describe the specific skills and the reason they are necessary for this course. Also describe how students will meet those skills.

No Value

Objective 6: For other Limitations on Enrollment not covered above, indicate the limitation on enrollment and the reason it is necessary for this course. Also describe how students will be able to meet the requirement.

No Value

De Anza GE Form

Criteria 1: Present core concepts and scope that define the discipline. (ONLY using the Outline, Assignments or Methods of Evaluation areas, cite, copy and paste the area referenced.)

No Value

Criteria 2: Foster oral and written communication and collaborative exercises. Note that this criteria has three separate pieces: oral communication, written communication, and collaborative exercises. (ONLY using the Outline, Assignments or Methods of Evaluation areas, cite, copy and paste the area referenced.)

No Value

Criteria 3: Stimulate critical thinking. (ONLY using the Outline, Assignments or Methods of Evaluation areas, cite, copy and paste the area referenced.)

No Value

Criteria 4: Include diverse perspectives and contributions in the discipline such as: gender, culture, values, and/or societal perspectives. (ONLY using the Outline, Assignments or Methods of Evaluation areas, cite, copy and paste the area referenced.)

No Value

Criteria 5: Provide global and historical context. (ONLY using the Outline, Assignments or Methods of Evaluation areas, cite, copy and paste the area referenced.)

No Value

Criteria 6: Use real-world or hands-on applications that will provide a context for the concepts being discussed. (ONLY using the Outline, Assignments or Methods of Evaluation areas, cite, copy and paste the area referenced.)

No Value

Comments

Stage 2: Department Chair

No Value

Stage 3: Division Curriculum Representative

No Value

Stage 4: Division Dean

No Value

Stage 5: SLO Coordinator

No Value

Stage 7: Content Review Matrix Liaison
No Value
Stage 8: Dean of Online Learning
No Value
Stage 9: Articulation Officer
No Value
Stage 10: De Anza General Education
No Value
Stage 13: Curriculum Committee
No Value

CO
Sort ID (00 < 10; 0 < 100)
CIS 017B
Course Status
New
Course Characteristics
CTE
Cross-Listed/Related Course Information
NA
Cross-Listed/Related Course ID's
No Value
DL Approval Date (MM/DD/YYYY)
06/17/2025
Hybrid Approval Date (MM/DD/YYYY)
06/17/2025
Curriculum Office Notes

No Value
