SANTA MONICA COLLEGE
ACADEMIC
SENATE
1900 Pico Boulevard
Santa Monica, CA 90405
310.434.4611

CURRICULUM COMMITTEE | AGENDA

Wednesday, April 1, 2015 | 3:00 p.m.
Loft Conference Room – Drescher Hall 300-E

Members:

Guido Davis Del Piccolo, *Chair*	Ida Danzey	Karen Legg	Rizwan Rashid (AS)
Georgia Lorenz, *Vice Chair*	Ron Furuyama	Walt Louie	Elaine Roque
Terrin Adair-Lynch	Sandra Hutchinson	Jenny Merlic	David Shirinyan
Brenda Antrim (non-voting)	Maral Hyeler	Eric Minzenberg	Mark Tomasic
Sang Chi	William Konya	Estela Narrie	Toni Trives
Caitlin Corker (AS)	Helen LeDonne	James Pacchioli	Odemaris Valdivia

Interested Parties:

Jamey Anderson	Jonathan Eady (AS)	Steven Myrow	
Maria Bonin	Kiersten Elliott	Linda Sinclair	Chris Young
Patricia Burson	Katharine Muller	Sal Veas	

Ex-Officio Members:

Eve Adler	Ali Khan

A G E N D A

(Items for action are listed alphabetically; items for information are listed numerically)

I. Call to order
II. Public Comments*
III. Approval of Minutes.....
IV. Chair's report
V. Information Items:

Course Updates:

1. ANTHRO4 Methods Of Archaeology

VI. Action Items:

New Course:

a. ASTRON 9 Intermediate Astrophysics with Calculus (prerequisites MATH 8 and [PHYSICS 8 or 21]).....
b. GEOL 94 / GEOG 94 (prerequisite [SCI 10 or GEOL 4 or GEOG 5]; Skills Advisory: Eligibility for English 1) Introduction to Geoscience Field Methods.....

Program Revisions:

c. Anthropology Associate in Arts for Transfer (AA-T).....

VII. New Business:

d. Letter to CCCCO regarding Music AA-T and Computer Science AS-T

VIII. Adjournment

Please advise Guido Davis Del Piccolo (x. 3561), Georgia Lorenz (x. 4277) or Rebecca Weiland (x. 4844) if you are unable to attend this meeting.

**Five minutes is allotted to any member of the public who wishes to address the Curriculum Committee on a specific agenda item, for general public comments, or non-agenda items.*

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CURRICULUM COMMITTEE I MINUTES

Wednesday, March 18, 2015 I 3:00 p.m.
Loft Conference Room – Drescher Hall 300-E

Members Present:

Guido Davis Del Piccolo, *Chair*	Caitlin Corker (AS)	Walt Louie	James Pacchioli
Georgia Lorenz, *Vice Chair*	Ida Danzey	Jenny Merlic	Rizwan Rashid (AS)
Brenda Antrim (non-voting)	Sandra Hutchinson	Eric Minzenberg	David Shirinyan
Terrin Adair-Lynch	William Konya	Estela Narrie	Toni Trives
Sang Chi	Helen LeDonne	Elaine Roque	Odemaris Valdivia

Members Absent:

Ron Furuyama	Karen Legg	Maral Hyeler	Mark Tomasic

Others Present:

Deborah Schwyter	Wendy Parise	Laura Manson

MINUTES

(Items for action are listed alphabetically; items for information are listed numerically)

I. Call to order:
The meeting was called to order at 3:11pm.

II. Public Comments*:
None.

III. Approval of Minutes:
The minutes of March 4, 2015 were approved with the following addition under New Business:
Some members of the Curriculum Committee expressed concern at the possibility of SMC arbitrarily deciding not grant multiple degrees if the degrees were deemed as "too similar". Instead, the position was expressed that if a student satisfied the requirements of any degree, it should be awarded.

IV. Chair's report:
- Guido reported that all approved action items from the previous meeting were approved by the Academic Senate on 3/17/2015.

V. Information Items:

Course Updates:

1. ACCTG 35/ CIS 35 Quickbooks
2. AUTO 40 Automotive Maintenance And Operation
3. AUTO 45 Automotive Braking Systems
4. AUTO 46 Automotive Electrical Systems
5. MATH 7 Calculus 1
6. MATH 8 Calculus 2

VI. Action Items:

New Course:

**Five minutes is allotted to any member of the public who wishes to address the Curriculum Committee on a specific agenda item, for general public comments, or non-agenda items.*

a. CHEM19 Introduction to General, Organic, and Biochemistry – presented by Deborah Schwyter.
Tentative course title. Final course title shall be presented to the Committee as an information item at a future meeting.
Motion made by: Eric Minzenberg **Seconded by:** Rizwan Rashid (AS)
The motion passed unanimously.

New Programs:

b. Political Science in Arts for Transfer (AA-T) – presented by Guido Del Piccolo
Motion made by: Estela Narrie **Seconded by:** Eric Minzenberg
The motion passed unanimously.

c. Early Intervention Assistant Associate in Science (AS) / Certificate of Achievement – presented by Wendy Parise and Laura Manson
Motion made by: Walt Louie **Seconded by:** Helen LeDonne
The motion passed unanimously.

VII. Adjournment
The meeting adjourned at 4:04pm.

Santa Monica College
New SMC Course
Expanded Course Outline for ASTRON 9 - Intermediate Astrophysics with Calculus

Course Cover	
Discipline	ASTRON-ASTRONOMY
Course#	9
Course Title	Intermediate Astrophysics with Calculus
Catalog Course Description	A robust calculus-based treatment of Astrophysics suited for science majors and mathematically-minded enthusiasts. The course makes use of methods in quantitative analysis including dynamical physics, differential and integral calculus, trigonometry and advanced graphing techniques to address a wide range of astronomical phenomena including stellar properties, interior structure, stellar evolution, variable stars, planetary atmospheres and gaseous nebulae, and the large-scale structure of the Universe. Emphasis will be placed on finding analytic solutions to problems in emerging areas of research such as exoplanetary systems, red giants, white dwarfs, supernovae, neutron stars, pulsars, black holes, the interstellar medium, dark matter, active galactic nuclei, gamma-ray bursts, dark energy and big bang nucleosynthesis. This curriculum provides a remarkable opportunity for the motivated student to experience the power of applying calculus-based physics to the frontiers of contemporary astrophysical problems.
Rationale	Astron 9 can initially be offered once per year as a more rigorous follow-up and/or alternative to Astron 8 available to students who have already taken Physics 21 or Physics 8 and therefore Calculus at the Math 7 and Math 8 levels. The course will be compatible with the highest lower-division astrophysics courses offered at UCLA (Astronomy 81) and CSUN (Astronomy 301). I plan to work with several of my research colleagues at both of these institutions to ensure articulation with these analogous UCLA & CSUN courses. This course may also serve to improve interdisciplinary contact among faculty in STEM fields such as physics, math, and engineering. I will also explore the satisfaction of course requirements for participation in the SMC Scholars Program. In my 15 years of teaching astronomy at SMC, I have collected a steady flow of requests from my best students to elaborate on the details of more complex quantitative calculations which I can only describe qualitatively within the confines of our most basic classes. Numerous students have sought counsel for progressing toward a more rigorous computational astrophysics course in an astronomy sequence which we have thus far been unable to offer. With the addition of both an introductory and intermediate astrophysics

	course to our astronomy portfolio, students will finally be able to try their hand at the types of problems facing contemporary astronomy researchers, while developing a feeling for the basic calculations that have formed the historical foundations of astronomy in the age of physics. By marketing the course to highly capable students of physics, chemistry, mathematics, and engineering, the college can form a vital interdisciplinary link between these closely related fields for a future in which increasing specialization will demand very active collaboration between narrow research paths. Regardless of whether these students originally intend to pursue astrophysics as a career, they may well find that the skills and appreciation they develop in this class will open a wide range of vocational specialization within their chosen fields such as the widespread engineering of optics and imaging systems (astronomical, atmospheric, terrestrial, and medical), or the chemistry and potential biochemistry of planetary systems and interstellar debris. By adding a course such as Astronomy 9: Intermediate Astrophysics to the repertoire of the Astronomy Division of the Earth Science Dept, we will not only do a better job of extending critical opportunities to our most motivated students; we will also increase the prestige of Santa Monica College as an institution which is capable of producing an atmosphere of scholarship on par or beyond that of lower-division course offerings at highly-regarded four-year universities. Of the six astronomy courses currently offered by the college, none require or nor recommend any prerequisite level of basic mathematical background. In a science that is essentially the physics of the planetary, stellar, and extragalactic realms, one is unable to properly express the diverse patterns and underlying laws governing the cosmos without the universal language of math. At SMC, there is an unfilled niche for computationally rigorous lower-division classes in astrophysics such as a student intending to major in astronomy (or several related subjects such as physics, chemistry, mathematics, or engineering) might take in the second year of undergraduate study.
Proposal Information	
Proposed Start	Year: 2015 Semester: Spring
Course Unit/Hours	
Credit Hours	Min: 3.00
Weekly Lecture Hours	Min: 3.00 (Sem: 54)
Total Hours	54.00
Grading Methods	Letter Grade or P/NP
Transfer/General Ed	
Transferability	

Transfers to UC (pending review)
Transfers to CSU

IGETC Area:

(pending review)

- IGETC Area 5: Physical and Biological Sciences (mark all that apply)
  - 5A: Physical Science

CSU GE Area:

(pending review)

- CSU GE Area B: Scientific Inquiry and Quantitative Reasoning (mark all that apply)
  - B1 - Physical Science

SMC GE Area:

- GENERAL EDUCATION PATTERN (SMC GE)
  - Area I: Natural Science

Comparable Transfer Courses:

- **California Community College**
  Southwestern College
  Modern Astrophysics Astr 205
- **UC**
  UC Los Angeles
  Astrophysics I Astr 81
- **UC**
  UC Los Angeles
  Astrophysics II Astr 82

Program Applicability

Designation	Credit - Degree Applicable
Proposed For	**AA Degree** -General Science **Certificate of Achievement** -IGETC CSUGE

Pre/Corequisites & Advisories

Prerequisite
MATH 8 and PHYSCS 8 or PHYSCS 21

Content Review

PHYSCS 8 - Prerequisite (Content to Objective)

Course Objectives

Upon satisfactory completion of the course, students will be able to:

1. Apply principles of classical physics to address astronomical phenomena.	
2. Compute exact solutions for astrophysical problems from first principles by formulating expressions using integral and differential calculus.	
3. Construct mathematical models designed to illustrate contemporary discoveries in stellar evolution, extra-galactic cosmology, and planetary systems.	
4. Derive first-order approximations to efficiently solve astrophysical equations and employ methods of error analysis to evaluate the accuracy of those approximations.	
5. Demonstrate clear understanding of scientific methodology by performing quantitative assessments including testing of mathematical models by comparing with collected data.	
6. Examine and explain the general significance of astrophysical concepts, and interpret the findings of related calculations through clear communication of the main ideas.	
Arranged Hours Objectives	
Upon satisfactory completion of the course, students will be able to:	
Course Content	
10%	**Review of the Physical Universe**
20%	Properties of Stars, Distances, Masses, Luminosities, Temperatures, Hydrostatic Equilibrium, Variable Stars
15%	Astrophysical Kinematics, Celestial Dynamics, Dark Matter, Galactic Structure, Spiral Density Waves, Active Galactic Nuclei
15%	Stellar Interiors, Planetary Atmospheres, Gaseous Nebulae, Interstellar Medium, Star Formation
15%	Star, Planet, and Galaxy Formation/Evolution
15%	Red Giants, White Dwarfs, Neutron Stars, Black Holes, High-Energy Phenomena, Gamma-Ray Bursts, Degenerate Stellar Collapse, Quasars
10%	Large Scale Structure of the Universe, Hubble Law, Dark Energy, Big Bang Nucleosynthesis, Cosmic Microwave Background and Inflation Theory
Total: 100%	
Methods of Presentation	
Opt Heading	
Methods	Group Work Lecture and Discussion Observation and Demonstration Projects
Methods of Evaluation	
Methods	• 5% - Class Participation • 25% - Exams/Tests • 20% - Final exam • 30% - Homework • 10% - Quizzes

	• 10% - Research Projects • 100% - Total

Appropriate Textbooks

Textbooks such as the following are appropriate:

Formatting Style	APA

Textbooks

1. Ryden, B. and Peterson B. *Foundations of Astrophysics*, 10th ed ed. Addison-Wesley Longman, 2010, ISBN: 0321595580.

2. Karttunen H. et al. *Fundamental Astronomy*, 5th ed ed. Springer, 2007, ISBN: 3540341439.

3. Carroll, B. and Ostlie D.. . *An Introduction to Modern Astrophysics*, 2nd ed ed. Pearson Addison-Wesley, 2006, ISBN: 0805304029.

4. Zeilik M, and Gregory S.. . *Introductory Astronomy and Astrophysics*, 4th ed ed. Saunders, 1997, ISBN: 0030062284.

5. Shu F.. . *The Physical Universe: An Introduction to Astronomy*, 1st ed ed. University Science Books, 1982, ISBN: 0935702059.

Assignments

Sample Assignment #1)
Let Z be the mean ANGULAR velocity of galactic disk stars at a distance r from the center of the Galaxy. Oort's dynamical constants A (one-half the "shear") and B (one-half the "vorticity") are defined by the differential expressions
A = (-r/2) * dZ/dr and
B = (-1/2r) * d (Z*r^2)/dr
show that Z = A - B, which equals -B only if A=0, i.e. only if Z corresponds to uniform rotation. Analysis of the local differential stellar space motions yields A = 0.0050 km per sec per light-year. Measurement of the ratio of random velocities in the radial and circular directions yields (1 - A/B)^1/2 = 1.6 (Show that this ratio equals 1 for A = 0) Compute the numerical value of B in the solar neighborhood, and calculate the rotation period 2*pi/Z in millions of years. If r = 30,000 light years, calculate the circular speed v=r*Z, and estimate the mass of the Galaxy interior to the solar circle by the crude formula M = rv^2/G. Convert your answer to solar masses.
BONUS ROUND: To obtain B, can we use the proper motions of disk stars measured relative to quasars as background objects that do not share in the rotation of our Galaxy? Since quasars are extra-galactic objects, are they easily seen through the plane of the disk, where there is considerable extinction by interstellar dust?
Sample Assignment #2)
Our class derivation of the Luminosity from a spherically-symmetric stellar interior showed that
L = ((4/3)*pi*R^3)(aT^4)/3R^2/lc
where R is the radius of the star, T is its mean interior temperature, a is the Stefan-Boltzman radiation constant, c is the speed of light, and l is the mean free path for the "random-walk" of a photon. To derive a Mass-Luminosity relationship, we need to express T and l in terms of M and R. Since we are primarily interested in the proportional relationships, you may use the opacity of main-sequence stars such that the mean free path l can be approximated by
l ~ T^3.5/rho^2 for stars with low to medium mass (bound electron contribution from temperature-dependent ionization states of inner shell orbitals contributing to X-ray opacity)
l ~ 1/rho for stars with high to very high mass (scattering of X-rays off free electrons which depends only on the ambient electron density)
where rho is the mean density of free electrons. Argue that
rho ~ M/R^3 and P ~ GM^2/R^4
where P is the total pressure. In stars with low to high mass, P can be taken as the gas pressure, whereas in stars with very high mass, radiation pressure dominates. Show that
P ~ rho * T for stars with low to high mass
P ~ T^4 for stars with very high mass.
Use these relationships to demonstrate the results

L ~ M^5.5/R^0.5 for stars with low to medium mass
L ~ M^3 for stars with high mass
L ~ M for stars with very high mass
In order to fuse hydrogen in a stellar core in stars with low to medium mass R ~ M, therefore show that L ~ M^5 is a representative function. If we ignore extremely rare stars of very high mass, argue that L ~ M^4 provides a reasonable approximation for the majority of the stars on the main sequence.
For a representative sample of main-sequence stars in a Spiral Galaxy, INTEGRATE the mass-luminosity function to derive an expression for the total power output provided by hydrogen-burning stars over the entire galactic population.

Estimate the lifetime of a star as a function of mass if one assumes that the core fuel supply is proportional to the mass of the star.

Student Learning Outcomes

1. Students will apply differential and integral calculus, dynamical physics, advanced graphing techniques, and functional analysis to build robust solutions to a range of stellar, planetary, and extragalactic astrophysical phenomena.

2. Students will develop the skills to solve astrophysics problems by determining quantitative results and explaining the significance of their qualitative behavior.

3. Students will complement their progress in the exact sciences by refining their ability to make expedient approximations simplifying complex equations and reducing seemingly insurmountable problems into "back-of-the-envelope" calculations that rapidly reveal "bottom-line" practical answers to astrophysics questions.

4. Students will apply principles of physics in mechanics and thermodynamics to address astrophysical problems using a rigorous level of calculus-based analysis.

Minimum Qualification

Minimum Qualifications:	Astronomy (Masters Required)

Library

List of suggested materials?	Yes

Attached Files

Astron 9 textbooks
Math 8 Prereq v2
Physics 21 Prereq v2

Prerequisite / Corequisite Checklist and Worksheet

Astronomy 9: Intermediate Astrophysics with Calculus

Prerequisite: Math 8 – Calculus 2

Other prerequisites, corequisites, and advisories also required for this course: Physics 21, Math 7
(Please note that a separate sheet is required for each prerequisite, corequisite, or advisory)

Physics 21: Mechanics with Lab (Calculus-based) or Physics 8

SECTION 1 - CONTENT REVIEW: If any criterion is not met, the prerequisite will be disallowed.

Criterion	Met	Not Met
1. Faculty with appropriate expertise have been involved in the determination of the prerequisite, corequisite or advisory.	X	
2. The department in which the course is (will be) taught has considered course objectives in accordance with accreditation standards.	X	
3. Selection of this prerequisite, corequisite or advisory is based on tests, the type and number of examinations, and grading criteria.	X	
4. Selection of this prerequisite, corequisite or advisory is based on a detailed course syllabus and outline of record, related instructional materials and course format.	X	
5. The body of knowledge and/or skills which are necessary for success before and/or concurrent with enrollment have been specified in writing.	X	
6. The course materials presented in this prerequisite or corequisite have been reviewed and determined to teach knowledge or skills needed for success in the course requiring this prerequisite.	X	
7. The body of knowledge and/or skills necessary for success in the course have been matched with the knowledge and skills developed by the prerequisite, corequisite or advisory.	X	
8. The body of knowledge and/or skills taught in the prerequisite are not an instructional unit of the course requiring the prerequisite.	X	
9. Written documentation that steps 1 to 8 above have been taken is readily available in departmental files.	X	

SECTION II - ADDITIONAL LEVEL OF SCRUTINY:

In addition to the affirmation of content review listed in section I, an additional level of scrutiny is also required. The level of scrutiny depends on which type of prerequisite is involved. There are six types and each is listed below. Please identify which one is being used to justify the proposed prerequisite. The additional level of scrutiny corresponding to each type of prerequisite is identified below.

Type 1: Standard Prerequisite (required prerequisite at UC or CSU)

X Identify three UC or CSU campuses that offer the equivalent course with the equivalent prerequisite.

List schools here: UCLA Astro 81/82, CSUN Astro 301, Southwestern College 205

Complete the Prerequisite Worksheet

Prerequisite Worksheet

ENTRANCE SKILLS FOR **Astronomy 9**

(What the student needs to be able to do or understand BEFORE entering the course in order to be successful)

A)	Model word problems with physical equations and mathematical expressions, as needed to derive quantitative solutions through calculus-based analysis.
B)	Retain a working knowledge of scientific methodology, including data collection and error analysis, including testing of a mathematical model by comparing with collected data.
C)	Communicate clear understanding of concepts in calculus-based physics (mechanics only).
D)	Demonstrate basic competency in using analysis tools, including kinematics, dynamics, integral and differential calculus, trigonometry, algebra of functions, and basic methods of approximation.

EXIT SKILLS (objectives) FOR **Math 8**

(What the student has the demonstrated ability to do or understand AFTER successful completion of this course)

1.	Differentiate and integrate hyperbolic, logarithmic, exponential and inverse trigonometric functions.
2.	Evaluate integrals using techniques including integration by parts, partial fractions, trigonometric integrals, and trigonometric and other substitutions.
3.	Solve integral application problems including surface area of surfaces of revolution and center of mass.
4.	Identify and evaluate indeterminate forms and improper integrals using techniques including L'Hopital's Rule.
5.	Graph polar curves and curves described by parametric equations.
6.	Determine whether an infinite sequence converges or diverges.
7.	Analyze the relationship between an infinite series, the sequence of its terms, and the sequence of its partial sums.
8.	Determine whether an infinite series converges absolutely, converges conditionally or diverges using techniques including the direct comparison, limit comparison, root, ratio, integral, p-series, nth-term and alternating series tests.

	ENTRANCE SKILLS FOR Astronomy 9								
EXIT SKILLS FOR Math 8		A	B	C	D	E	F	G	H
	1	X			X				
	2	X			X				
	3	X			X				
	4				X				
	5	X		X	X				
	6				X				
	7		X	X	X				
	8		X		X				

Prerequisite / Corequisite Checklist and Worksheet

Astronomy 9: Intermediate Astrophysics with Calculus

Prerequisite: Physics 21: Mechanics with Lab (Calculus-based) or Physics 8: Calculus-based General Physics 1 with Lab

Other prerequisites, corequisites, and advisories also required for this course: Math 8
(Please note that a separate sheet is required for each prerequisite, corequisite, or advisory)

Math 8: Calculus 2

SECTION 1 - CONTENT REVIEW: If any criterion is not met, the prerequisite will be disallowed.

Criterion	Met	Not Met
1. Faculty with appropriate expertise have been involved in the determination of the prerequisite, corequisite or advisory.	X	
2. The department in which the course is (will be) taught has considered course objectives in accordance with accreditation standards.	X	
3. Selection of this prerequisite, corequisite or advisory is based on tests, the type and number of examinations, and grading criteria.	X	
4. Selection of this prerequisite, corequisite or advisory is based on a detailed course syllabus and outline of record, related instructional materials and course format.	X	
5. The body of knowledge and/or skills which are necessary for success before and/or concurrent with enrollment have been specified in writing.	X	
6. The course materials presented in this prerequisite or corequisite have been reviewed and determined to teach knowledge or skills needed for success in the course requiring this prerequisite.	X	
7. The body of knowledge and/or skills necessary for success in the course have been matched with the knowledge and skills developed by the prerequisite, corequisite or advisory.	X	
8. The body of knowledge and/or skills taught in the prerequisite are not an instructional unit of the course requiring the prerequisite.	X	
9. Written documentation that steps 1 to 8 above have been taken is readily available in departmental files.	X	

SECTION II - ADDITIONAL LEVEL OF SCRUTINY:

In addition to the affirmation of content review listed in section I, an additional level of scrutiny is also required. The level of scrutiny depends on which type of prerequisite is involved. There are six types and each is listed below. Please identify which one is being used to justify the proposed prerequisite. The additional level of scrutiny corresponding to each type of prerequisite is identified below.

Type 1: Standard Prerequisite (required prerequisite at UC or CSU)

X Identify three UC or CSU campuses that offer the equivalent course with the equivalent prerequisite.

List schools here: UCLA Astro 81/82, CSUN Astro 301, Southwestern College 205

Complete the Prerequisite Worksheet

modified 09/26/2012

Prerequisite Worksheet

ENTRANCE SKILLS FOR **Astronomy 9**

(What the student needs to be able to do or understand BEFORE entering the course in order to be successful)

A)	Model word problems with physical equations and mathematical expressions, as needed to derive quantitative solutions through calculus-based analysis.
B)	Retain a working knowledge of scientific methodology, including data collection and error analysis, including testing of a mathematical model by comparing with collected data.
C)	Communicate clear understanding of concepts in calculus-based physics (mechanics only).
D)	Demonstrate basic competency in using analysis tools, including kinematics, dynamics, integral and differential calculus, trigonometry, algebra of functions, and basic methods of approximation.

EXIT SKILLS (objectives) FOR **Physics 21**

(What the student has the demonstrated ability to do or understand AFTER successful completion of this course)

1.	Use the basic concepts in physics to qualitatively explain physical phenomena.
2.	Compile data from a physical problem and synthesize these data into a mathematical problem.
3.	Take the mathematical problem to a successful conclusion using mathematical principles of algebra, trigonometry, and calculus.
4.	Operate, adjust, and use the equipment necessary in laboratory experiments to obtain quantitative measurements.
5.	Learn to estimate the uncertainty of a measurement ant the results obtained from such measurements.
6.	Use the mathematical tools of the computer, such as spreadsheets and graphing programs, to analyze data.
7.	Write laboratory reports including statement of purpose, compilation of data, theory involved in the experiment, method of measurements, samples of calculations, tabulation of results, and analyses of sources of error.
8.	Ultimately, through satisfying these objectives, a strong foundation is laid in the various principles of physics, so that students enrolling in more advanced courses will be able to succeed and continue their science education.

	ENTRANCE SKILLS FOR (Astronomy 9)								
EXIT SKILLS FOR (Physics 21)		A	B	C	D	E	F	G	H
	1		X	X	X				
	2	X	X		X				
	3	X			X				
	4		X						
	5		X	X					
	6	X	X		X				
	7		X	X					
	8	X	X	X	X				

Santa Monica College
New SMC Course
Expanded Course Outline for GEOL 94 / GEOG 94- Introduction to Geoscience Field Methods

Course Cover	
Discipline	GEOL-GEOLOGY
Course Number	94
Full Course Title	Introduction to Geoscience Field Methods
Cross Listed Course	GEOGRAPHY 94
Catalog Course Description	This course will introduce students to field methods in Geoscience, including Geology and Geography. Students will apply the scientific method to their field queries, learn how to design and implement field-based research, and standard protocols such as obtaining required permitting to access field sites. They will also be introduced to commonly used field instruments, practice using these instruments to gather data in a field setting, and communicate results and data interpretation in conventional scientific formats. Field trip attendance is required.
Rationale	
Rationale	The development of this course is outlined in the HSI-STEM grant awarded to SMC in 2011. ERTHSC 11 is designed to compliment Science 10: Introduction to Scientific Research. It will provide students with experience designing field work and collecting field data.
Proposal Information	
Proposed Start	Year: 2015 Semester: Fall

Course Unit/Hours	
Credit Hours	Min: 2.00
Weekly Lecture Hours	Min: 1.00 (Sem: 18)
Weekly Laboratory Hours	Min: 0
Weekly Arranged Hours	Min: 3.00 (Sem: 54)
Total Semester Instructional Hours	72.00
Load Factor	1.00
Load Factor Rationale	The load factor is consistent with other field courses in Earth Science.
Repeatability	May be repeated 0 time(s)
Notes on Repeatability (for the	Letter designations will indicate which disciplines/projects are involved. Students may retake course with different letter designations.

student)	
Grading Methods	Letter Grade or P/NP
Transfer/General Ed	
Transferability	
Transfers to UC (pending review) Transfers to CSU	
IGETC Area:	
Does NOT satisfy any area of IGETC:	
CSU GE Area:	
Does NOT satisfy any area of CSU GE:	
SMC GE Area:	
Does NOT satisfy any area of SMC GE:	
Comparable Transfer Courses:	
Program Applicability	
Designation	Credit - Degree Applicable
Proposed For	
Pre/Corequisites & Advisories	
Prerequisite SCI 10 or GEOL 4 or GEOG 5 **Skills Advisory** Eligibility for English 1	
Course Objectives	
Upon satisfactory completion of the course, students will be able to:	
1. Apply the scientific method to field-based research.	
2. Design a plan for conducting field-based research.	
3. Acquire and record data and other key information in a field setting.	
4. Analyze and interpret data in the context of the scientific method.	
5. Communicate scientific ideas effectively.	
Arranged Hours Objectives	
Upon satisfactory completion of the course, students will be able to:	
1. Design a plan for field-based geoscience research.	
2. Collect data in a field setting.	
3. Analyze, interpret and present scientific data.	
Course Content	
20%	Introduction to the scientific method with application to field-based research.
25%	Introduction to instrumentation and other research tools.

25%	Introduction to design of field excursions for data collection.
20%	Introduction to analysis and presentation of data collected in a field setting.
10%	Oral and written communication of scientific research.
Total: 100%	
Arranged Hours Instructional Activities	
Methods	Field Experience Field Trips Lab Observation and Demonstration Projects
Methods of Presentation	
Methods	Field Experience Field Trips Lecture and Discussion
Other Methods	Lecture and discussion are required to give background for specialized field-based research. This will be provided via lectures and hands-on activities.
Methods of Evaluation	
Methods	• 20% - Class Participation Students will be assessed on their active participation in gathering and analyzing data. • 20% - Exams/Tests • 30% - Research Projects Students will be required to present data (written or oral presentation) gathered in the field. • 30% - Written assignments Field notes will be assessed. • 100% - Total
Appropriate Textbooks	
Textbooks such as the following are appropriate:	
1. Clifford, N., French, S., Valentine, G.. *Key Methods in Geography*, 2nd ed. SAGE Publications Ltd, 2010	
2. Coe, A.L. *Geological Field Techniques*, ed. Wiley-Blackwell, 2011, ISBN: 978-1-4443-3062-5.	
Assignments	
Sample Assignment	
ASSIGNMENT #1: Plan for field research Field research requires careful and consistent note-taking, illustrations, and data organization. In this assignment, students will practice gathering materials, preparing a	

field notebook and developing a structured way to record findings in a field setting.

Preparation should include:

1. Purpose of field research (hypothesis to be addressed).

2. Notes/illustrations of previously researched material to reference during field excursion.

3. Outline of data to be collected during excursion including sampling resolution.

4. Materials required for data collection.

5. Directions.

6. Emergency contact information.

7. Site permits if required.

ASSIGNMENT #2: Measurement of stratigraphic section and construction of a stratigraphic column of the Vasquez and Mint Canyon Formations, Vasquez Rocks Natural Area, Santa Clarita

Vasquez Rocks Natural Area provides easily accessible outcrop Miocene-aged (12-25 Mya) siltstones, sandstones, and conglomerates. The outcrop is bedded and tilted at an angle of 50° from horizontal so that different sections of the outcrop represent different, but overlapping intervals of deposition of sedimentary deposition.

Field portion of assignment: Students will work in groups of three to take stratigraphic measurements of various portions of the outcrop using a Jacob's staff and a Brunton compass. The students will be assigned the following roles:

1. Jacob staff and rock identification – this student will be in charge of making accurate measurements of and tallying bed thickness with a Jacob staff and help with rock identification.

2. Brunton compass and rock identification – this student will be in charge of making sure the Jacob staff is leveled and assist with rock identification.

3. Recorder – this student will record and tally Jacob staff measurements and rock identifications. He/she will also assist in rock identification and will double-check Jacob staff orientation with student 2.

Construction of stratigraphic columns: Students will draw their own stratigraphic columns based on measurements made in the field complete with a legend for symbology

and a scale. Once their stratigraphic columns are constructed they will turn in their completed columns to the instructor.

Correlation of stratigraphic columns: Given a class size of 15-18 students, 5-6 individual stratigraphic columns should be generated by the class as a whole. The instructor will organize and distribute 3-4 overlapping stratigraphic columns for students to correlate individually using basic lithostratigraphic principles and interpret the change in depositional environments throughout their correlated sections.

Student Learning Outcomes

1. By completion of this course, students will be able to design an effective field-based data collection plan for geoscience research projects.
2. By completion of this course, students will be able to make and properly record field-based measurements.
3. By completion of this course, students will be able to analyze and interpret field data and communicate interpretations to a scientific audience.

Minimum Qualification

Minimum Qualifications:	Earth Science (Masters Required) Geography (Masters Required)

Library

List of suggested materials has been given to librarian?	No
Library has adequate materials to support course?	No

Attached Files

English 21B Prerequisite
SCI 10, GEOL 4, GEOG 5 prereq form

Prerequisite / Corequisite Checklist and Worksheet

GEOLOGY 94 / GEOGRAPHY 94: Introduction to Geoscience Field Methods

Prerequisite: Science 10: Principles and Practice of Scientific Research **OR**
Geology 4: Introduction to Geology with Lab **OR**
Geography 5: Introduction to Geography with Lab

Other prerequisites, corequisites, and advisories also required for this course:
(Please note that a separate sheet is required for each prerequisite, corequisite, or advisory)

Advisory: Eligibility for English 1

SECTION 1 - CONTENT REVIEW: If any criterion is not met, the prerequisite will be disallowed.

Criterion	Met	Not Met
1. Faculty with appropriate expertise have been involved in the determination of the prerequisite, corequisite or advisory.	X	
2. The department in which the course is (will be) taught has considered course objectives in accordance with accreditation standards.	X	
3. Selection of this prerequisite, corequisite or advisory is based on tests, the type and number of examinations, and grading criteria.	X	
4. Selection of this prerequisite, corequisite or advisory is based on a detailed course syllabus and outline of record, related instructional materials and course format.	X	
5. The body of knowledge and/or skills which are necessary for success before and/or concurrent with enrollment have been specified in writing.	X	
6. The course materials presented in this prerequisite or corequisite have been reviewed and determined to teach knowledge or skills needed for success in the course requiring this prerequisite.	X	
7. The body of knowledge and/or skills necessary for success in the course have been matched with the knowledge and skills developed by the prerequisite, corequisite or advisory.	X	
8. The body of knowledge and/or skills taught in the prerequisite are not an instructional unit of the course requiring the prerequisite.	X	
9. Written documentation that steps 1 to 8 above have been taken is readily available in departmental files.	X	

SECTION II - ADDITIONAL LEVEL OF SCRUTINY:

In addition to the affirmation of content review listed in section I, an additional level of scrutiny is also required. The level of scrutiny depends on which type of prerequisite is involved. There are six types and each is listed below. Please identify which one is being used to justify the proposed prerequisite. The additional level of scrutiny corresponding to each type of prerequisite is identified below.

X Type 2: Sequential within and across disciplines (e.g., Physics 7, 8, 9, …)
Complete the Prerequisite Worksheet

Science 10 provides an introduction to the research process giving a foundation for the more advanced skills in literature evaluation, design of a related series of experiments, selection and integration of protocols, and data interpretation emphasized in GEOLOGY 94 / GEOGRAPHY 94.

Prerequisite Worksheet

ENTRANCE SKILLS FOR **GEOLOGY 94 / GEOGRAPHY 94**
(What the student needs to be able to do or understand BEFORE entering the course in order to be successful)

A)	Extract information from scientific literature that is pertinent to formulating research questions and experimental design.
B)	Propose hypotheses that can be tested by field methods.
C)	Design and conduct experiments that will effectively test a scientific hypothesis.
D)	Collect scientific data with accuracy.
E)	Recognize and utilize statistical methods applicable to specific data sets.
F)	Relate data interpretation to existing knowledge presented in scientific literature.
G)	Communicate research findings in conventional scientific formats.

EXIT SKILLS (objectives) FOR **Science 10, Geology 4, Geography 5**
(What the student has the demonstrated ability to do or understand AFTER successful completion of this course)

1.	Trace the progression of modern scientific research projects from proposals through funding, experimentation, and dissemination.
2.	Formulate a scientifically testable hypothesis.
3.	Design and conduct experiments that will effectively test a scientific hypothesis.
4.	Collect scientific data with safety and accuracy.
5.	Employ appropriate statistical methods to evaluate collected data.
6.	Critique peer-reviewed scientific articles.
7.	Use oral and written communication methods to present findings in formats recognized by the scientific community, including journal articles and poster presentations.

	ENTRANCE SKILLS FOR GEOLOGY 94 / GEOGRAPHY 94							
EXIT SKILLS FOR Science 10, Geology 4, Geography 5		A	B	C	D	E	F	G
	1							
	2		X					
	3			X				
	4				X			
	5					X		
	6	X					X	
	7							X

Prerequisite / Corequisite Checklist and Worksheet

GEOLOGY 94 / GEOGRAPHY 94
Skills Advisory: Eligibility for English 1
Other prerequisites, corequisites, and advisories also required for this course: (Please note that a separate sheet is required for each prerequisite, corequisite, or advisory)
Prerequisite: Science 10: Principles and Practice of Scientific Research OR
Prerequisite: Geology 4: Introduction to Geology with Lab OR
Prerequisite: Geography 5: Introduction to Geography with Lab

SECTION 1 - CONTENT REVIEW: If any criterion is not met, the prerequisite will be disallowed.

Criterion	Met	Not Met
1. Faculty with appropriate expertise have been involved in the determination of the prerequisite, corequisite or advisory.	**X**	
2. The department in which the course is (will be) taught has considered course objectives in accordance with accreditation standards.	**X**	
3. Selection of this prerequisite, corequisite or advisory is based on tests, the type and number of examinations, and grading criteria.	**X**	
4. Selection of this prerequisite, corequisite or advisory is based on a detailed course syllabus and outline of record, related instructional materials and course format.	**X**	
5. The body of knowledge and/or skills which are necessary for success before and/or concurrent with enrollment have been specified in writing.	**X**	
6. The course materials presented in this prerequisite or corequisite have been reviewed and determined to teach knowledge or skills needed for success in the course requiring this prerequisite.	**X**	
7. The body of knowledge and/or skills necessary for success in the course have been matched with the knowledge and skills developed by the prerequisite, corequisite or advisory.	**X**	
8. The body of knowledge and/or skills taught in the prerequisite are not an instructional unit of the course requiring the prerequisite.	**X**	
9. Written documentation that steps 1 to 8 above have been taken is readily available in departmental files.	**X**	

SECTION II - ADDITIONAL LEVEL OF SCRUTINY:
In addition to the affirmation of content review listed in section I, an additional level of scrutiny is also required. The level of scrutiny depends on which type of prerequisite is involved. There are six types and each is listed below. Please identify which one is being used to justify the proposed prerequisite. The additional level of scrutiny corresponding to each type of prerequisite is identified below.

X Type 3: Course in communication or computational skills as prerequisite for course other than another skills course (e.g., English 1 prerequisite for Anatomy 1)

Complete the Prerequisite Worksheet

Complete Data Analysis

Prerequisite Worksheet

ENTRANCE SKILLS FOR **GEOLOGY 94 / GEOGRAPHY 94**

(What the student needs to be able to do or understand BEFORE entering the course in order to be successful)

A)	Extract information from scientific literature that is pertinent to formulating research questions and experimental design.
B)	Propose hypotheses that can be tested by field methods.
C)	Design and conduct experiments that will effectively test a scientific hypothesis.
D)	Collect scientific data with accuracy.
E)	Recognize and utilize statistical methods applicable to specific data sets.
F)	Relate data interpretation to existing knowledge presented in scientific literature.
G)	Communicate research findings in conventional scientific formats.

EXIT SKILLS (objectives) FOR **English 21B**

(What the student has the demonstrated ability to do or understand AFTER successful completion of this course)

1.	Write sentences of varying syntactical structure, generally free of grammatical, spelling and syntactical errors.
2.	Read, draw inferential and literal information from, and evaluate academic literature.
3.	Write strong topic sentences and situate them effectively within body paragraphs.
4.	Write effective introductory, body and concluding paragraphs in essays.
5.	Write coherent and cohesive expository essays, of at least five paragraphs that may include development through definition, description, exemplification, cause and effect, and classification.
6.	Use linking and transitional elements within sentences, between sentences and between paragraphs.
7.	Compose papers efficiently using various prewriting, planning, drafting, revising and editing strategies.
8.	After critically reading an article at a secondary/post-secondary level, the student will write, in an 80-minute period, a coherent essay containing a complete summary with an introduction, a thesis that demonstrates analytical thinking about the article, several supporting paragraphs, and a conclusion.

	ENTRANCE SKILLS FOR GEOLOGY 94 / GEOGRAPHY 94							
EXIT SKILLS FOR English 21B		A	B	C	D	E	F	G
	1							X
	2	X					X	X
	3							X
	4							X
	5	X					X	X
	6							X
	7							X
	8							X

Anthropology (revised 1/8/15)
Associate in Arts for Transfer (AA-T)

The Associate in Arts in Anthropology for Transfer (AA-T) involves the critical examination of human societies, both present and past. It provides basic information about humankind and is designed to stimulate critical thinking about ways of living in the world. The courses of this degree address the four sub-disciplines of Anthropology which attempt to understand basic aspects of humankind. Cultural Anthropology studies human behavior to understand the cultural values that guide the behaviors. Archaeology examines the material record of human activity in order to understand how ideas change over time. Anthropological Linguistics is the study of the human capacity for language and its use. Physical Anthropology (also called Biological Anthropology) is the study of human evolution which includes human biological diversity.

Upon completion of the Associate in Arts in Anthropology for Transfer (AA-T), students will have a strong academic foundation in the field and be prepared for upper division baccalaureate study. Completion of the degree indicates that the student will have satisfied the lower division requirements for transfer into history or similar major for many campuses in the California State University system.

This Associate degree for Transfer involves satisfactory completion of a minimum of 60 CSU-transferable semester units with an overall average grade of C or higher including the semester units of the area of emphasis (articulated below) and fulfillment of CSU GE, or IGETC. Students transferring to CSU must complete IGETC Area 1C. Each course in the area of emphasis must be completed with a grade of C or higher, or with a P if the course was taken on a Pass/No Pass basis, and the P is equal to a C or higher (Title 5 §55063). Note: while a minimum GPA of 2.0 (C) is required for admission, some CSU majors/campuses may require a higher GPA. Consult with a counselor for more information. Additional graduation requirements for the Associate degree are available at the Transfer/Counseling Center and online at www.smc.edu/articulation.

Catalog rights dictate that a student may satisfy the requirements of a degree or certificate by completing the general education and area of emphasis requirements in effect at any time of the student's continuous enrollment. Continuous enrollment is defined as enrollment in consecutive Fall and Spring semesters until completion.

Area of Emphasis

Required Core (minimum 9 units):		**Units**
ANTHRO 1 **or**	Physical Anthropology	3
ANTHRO 5	Physical Anthropology With Lab	4
ANTHRO 2	Cultural Anthropology	3
~~ANTHRO 3~~ (moved to Area C)	~~World Archaeology~~	~~3~~
ANTHRO 4 (moved from Area C)	Methods Of Archaeology	3

Area A: Select at least one of the following courses (3 units required):		**Units**
ANTHRO 7	Introduction To Linguistic Anthropology	3
ANTHRO 22	Magic Religion And Witchcraft	3
ENGL 2	Critical Analysis And Intermediate Composition	3
ENGL 31	Advanced Composition	3
GEOG 1	Introduction to the Natural Environment	3
GEOG 2	Introduction To Human Geography	3
HIST 47	The Practice Of History	3
MATH 54	Elementary Statistics	4

Area B: Select at least one of the following courses (3 units required):		**Units**
ANY COURSE NOT USED FOR AREA A		
ANATMY 1	Human Anatomy	4
GEOL 4	Physical Geology with Laboratory	4
GEOL 5	Earth History	4

PHILOS 6	Philosophy Of Science	3
PSYCH 7	Research Methods in Psychology	3
GIS 20 *(same as CIS 20, GEOG 20)*	Introduction To Geographic Information Systems	3

Area C: Select at least one of the following courses (3 units required):	**Units**
ANY COURSE NOT USED FOR AREA A OR AREA B ANTHROPOLOGY: 3, ~~4(REMOVE),~~ 9, 10, 14, 19, 20, 21, 35s ART HISTORY: 11, 71, 72 BUSINESS: 51 COMMUNICATION STUDIES: 14, 37 DANCE: 2 EARLY CHILDHOOD EDUCATION: 11, 18, 19 ECONOMICS: 5 ENGLISH: 9, 10, 34, 41, 53, 54 FILM STUDIES: 7 GEOGRAPHY: 2, 8, 11, 14 GLOBAL STUDIES: 5, 10, 11 HISTORY: 10, 16, 33, 34, 37, 38, 39, 41, 42, 43, 62 HEALTH: 60 LINGUISTICS: 1 MEDIA STUDIES: 10 MUSIC: 33, 37 NURSING: 60 NUTRITION: 7 POLITICAL SCIENCE: 5, 21 PSYCHOLOGY: 18 SOCIOLOGY: 1, 1s, 2, 2s, 30, 31, 32, 34 URBAN STUDIES: 8	3

Total Units for Area of Emphasis:	**18**