Introduction to Weather, Climate, and Astronomy for K-8 Teachers

Course Information

Department and course number: SCI 595

Credits: 4 graduate or undergraduate credits

Course meeting dates and times: June 20th – 24th and June 27th – July 1st from 8:00AM to 4:00PM

Course Locations: Beaverhead Building, Room 104, Salish Kootenai College

Course Instructors	e-mail	SKC Office	Phone
Tim Olson Salish Kootenai College Division of Sciences	Tim_Olson@skc.edu	Adeline Mathias Building Rm 123	(406) 275-2898
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Course Description

The primary focus of this course is on the deepening of K-8 inservice and preservice teachers' understanding of weather, climate, and astronomy content knowledge. Teachers enrolled in the course will spend the majority of their time engaged in a variety of learning experiences designed to investigate Earth's weather, the evolution of Earth's climate and the factors that control it, the origin and evolution of planets, stars, and the universe, and the methods scientists use to investigate these topics. Topics explored will be in alignment with the Montana Science Education Content Standards and will include classroom, laboratory and field based instructional methods.

The secondary focus of the course is on the development of teacher professional knowledge and skills that support rigorous K-8 science instruction, including pedagogical methods, curriculum development, teacher leadership, and cultural competency. Teachers will develop skills and knowledge in these areas of science teaching through the critical examination of effective science education pedagogy, review of the science education research literature, professional discourse with course participants including instructors, and the examination and production of artifacts such as culturally competent lesson sequences, and science models. Course activities will model effective instructional methods and assessments, providing opportunities for teachers to experience, critique, and adapt activities and methods for use in their own classrooms, schools, and districts.

Course Learning Outcomes

Through the successful completion of this course teachers will

1) deepen their conceptual understanding of weather and climate content knowledge,
2) deepen their conceptual understanding of astronomy content knowledge,
3) improve their ability to use scientific skills employed in these fields,

4) improve their understanding of the nature of science and how scientific knowledge is generated,
5) heighten their awareness of the interaction of science and society,
6) improve their ability to use educational technology that supports weather, climate, and astronomy education,
7) gain professional skills and knowledge that support the design and implementation of rigorous science instruction,
8) improve cultural competency in teaching American Indian students, and
9) improve their understanding of teacher leadership and their ability to act as science teacher leaders.

Course Materials

- Weather/Climate Textbook: *Visualizing Weather and Climate, 1st Edition,* Bruce Anderson and Alana Strahler, Wiley, 500 pp., ISBN -13 9780470147757 and ISBN – 10 047014775X
- Astronomy Textbook: *The Essential Cosmic Perspective, with Mastering Astronomy and Voyager SkyGazer Planetarium Software*, 6th edition, Jeffrey Bennett, Megan Donahue, Nicholas Schneider, Mark Voit, Addison-Wesley, 550pp., ISBN-10: 0805393927 and ISBN-13: 9780805393927
- Other readings as assigned by instructors

Note: Students will receive their texts prior to the course and will be assigned pre course readings.

Course Content

	Week 1 – Weather and Climate
Day	**Content and Skills**
Day 1	Course Introduction and Expectations
	Weather, Climate & Astronomy Teacher Pretest
	Weather Balloon Data Activity
	Structure and Composition of Earth's Atmosphere
	Daily Weather Data Collection
	Local and Global Effects of Surface Heating and Air Pressure Gradients
	Formative Assessment
Day 2	Energy, Phase Changes and the Water Cycles
	Relative Humidity
	Guest Instructor: Steve Running, UM – Climate Change
	Daily Weather Data Collection
	Cloud Formation
	Dew Point
	Assessment
Day 3	Cloud Identification and Classification
	Air Masses and Weather Maps
	Shandin Pete – Traditional Weather Knowledge/ Historical and Contemporary Indigenous Issues Related to Climate
	Daily Weather Data Collection
	Air Masses Lab
	Fronts and Weather Prediction Lab

	Assessment
Day 4	Relationship Between Daylight Hours and Climate Lab
	El Nino/La Nina Activities
	CSKT Tribal Natural Resource Professionals Panel – Effects of Climate Change on Tribal Natural Resources and Their Management
	Daily Weather Data Collection
	Climatographs and Culture
	The Influence of Flathead Lake on Local Weather
	Assessment
Day 5	Introduction to Paleoclimatology
	Guest Instructor – Anna Klenne, UM – Paleoclimatology Research
	Evidence of Past Climates Lab
	Daily Weather Data Collection
	Global Warming
	Assessment

	Week 2 - Astronomy
Day	**Content and Skills**
Day 6	Opening Prayer
	Geography of Our Solar System – Solar System Dynamical Model
	Indigenous Astronomy
	Planetary System Formation
	Comparative Planetology: Habitability of Planets
	Assessment
Day 7	Guest Instructor - Dr. Cindy Passmore, UC Berkeley – Earth, Moon, Sun Relationships and Related Phenomena – Model Based Reasoning
Day 8	Stellar Distances and Constellations – 3D Models
	Brightness of Stars: Luminosity/Distance/Apparent Brightness Relationships, Standard Candles
	Stellar Spectra
	Hertzsprung-Russell Diagram – Mass/Luminosity Relationships
	Assessment
Day 9	Stellar Life Cycles: Formation, Main Sequence, End States
	Indigenous Astronomy – Traditional Star Knowledge
	Our Galaxy – Structure of the Milky Way
	Galaxy Morphology
	Assessment
Day 10	Big Bang Cosmology – Hubble Law, Cosmic Nucleosynthesis
	Indigenous Astronomy Activity
	Large Scale Structure: Galaxy Clusters, Dark Matter, Dark Energy
	MSP-MIS Survey
	Course Evaluation/Feedback
	Post test

Evaluation

Students enrolled in the course will receive a traditional letter grade. Students will be evaluated using multiple methods and all assignments must be completed to at least a minimum standard of proficiency specified by instructors in order to receive a passing grade for the course. All course assignments must be completed and submitted no later than **August 1st, 2011.** Late work will not be accepted.

Points will be awarded to students as follows:

In class science inquiry/laboratory activities		60 points maximum
Daily science assessments		40 points maximum
Research based Science Teacher Leadership Plan (Graduate credit only)		20 points maximum
Total points possible	Undergraduate credit	100 points maximum
	Graduate credit	120 points maximum

Grades will be awarded using the following scale:

90 to 100% = A
80 to 89% = B
70 to 79% = C
60 to 69% = D
Less than 60% = F

Attendance

Regular attendance is required in order for students to have access to a rich and comprehensive learning experience. Most of the course points are awarded through completion of in class activities and daily assessments therefore regular attendance is also required for the successful completion of the course with a passing grade. No opportunities for make up work will be provided. Absences will only be excused if the student obtains prior approval from the lead instructor, Tim Olson.

Academic Integrity

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://www.umt.edu/SA/VPSA/index.cfm/page/1321. Violations of this code (including plagiarism or other forms for cheating) may result in the student failing the course.