

**Arizona State University Criteria Checklist for
NATURAL SCIENCES [SQ/SG]**

Rationale and Objectives

In a relatively short time in the history of civilized societies, humankind moved from what was essentially an agrarian population into an industrial age, which in recent years has been profoundly shaped by such scientific and technological advances as genetic engineering, the computer, and space exploration. Our history of irrepressible ingenuity makes a compelling case for a future that will be even more profoundly influenced by science and technology. It is imperative that we react expeditiously and effectively to the problems and the promise that these advances create. We must ensure that technological change is directed to the benefit of society and that it will promote human dignity and values. Success in achieving this goal will depend upon the insight and knowledge of political and public opinion leaders, and the scientific enlightenment of educated citizens. To a significant degree, the ability of these individuals to understand the nature of the issues and the alternative courses of action will be determined by the quality of science presented at the nation's institutions of higher learning.

The recommendation of at least one laboratory course that includes a substantial introduction to the fundamental behavior of matter and energy in physical or biological systems derives from a number of considerations. First, all physical and biological phenomena have at their roots the fundamental principles governing the behavior of matter and energy. These principles have been shown over a period of time to be a value in reliably predicting and rationalizing a broad range of phenomena. Unless the lines to these roots are established, our understanding of the broader range of the sciences, and other fields upon which these sciences impinge, will be impaired. Second, because these fundamental principles have been experimentally established beyond reasonable doubt, the essentials of the scientific method can be clearly and coherently revealed by their study. Third, the study of the behavior of matter and energy illustrates the usefulness of mathematics in precisely describing and rationalizing certain physical phenomena, and the expressiveness of mathematical equation.

10/1989

REV: 1/1991, 3/1991, 1/2000

Proposer: Please complete the following sections and attach appropriate documentation.

| ASU--[SQ] CRITERIA | | | |
|---|--------------------------|---|----------------------------------|
| I. - FOR ALL <i>QUANTITATIVE</i> [SQ] NATURAL SCIENCES CORE AREA COURSES, THE FOLLOWING ARE CRITICAL CRITERIA AND MUST BE MET: | | | |
| YES | NO | | Identify Documentation Submitted |
| <input type="checkbox"/> | <input type="checkbox"/> | A. Course emphasizes the mastery of basic scientific principles and concepts. | |
| <input type="checkbox"/> | <input type="checkbox"/> | B. Addresses knowledge of scientific method. | |
| <input type="checkbox"/> | <input type="checkbox"/> | C. Includes coverage of the methods of scientific inquiry that characterize the particular discipline. | |
| <input type="checkbox"/> | <input type="checkbox"/> | D. Addresses potential for uncertainty in scientific inquiry. | |
| <input type="checkbox"/> | <input type="checkbox"/> | E. Illustrates the usefulness of mathematics in scientific description and reasoning. | |
| <input type="checkbox"/> | <input type="checkbox"/> | F. Includes weekly laboratory and/or field sessions that provide hands-on exposure to scientific phenomena and methodology in the discipline, and enhance the learning of course material. | |
| <input type="checkbox"/> | <input type="checkbox"/> | G. Students submit written reports of laboratory experiments for constructive evaluation by the instructor. | |
| <input type="checkbox"/> | <input type="checkbox"/> | H. Course is general or introductory in nature, ordinarily at lower-division level; not a course with great depth or specificity. | |
| II. - AT LEAST ONE OF THE FOLLOWING ADDITIONAL CRITERIA MUST BE MET WITHIN THE CONTEXT OF THE COURSE: | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | A. Stresses understanding of the nature of basic scientific issues. | |
| <input type="checkbox"/> | <input type="checkbox"/> | B. Develops appreciation of the scope and reality of limitations in scientific capabilities. | |
| <input type="checkbox"/> | <input type="checkbox"/> | C. Discusses costs (time, human, financial) and risks of scientific inquiry. | |
| NOTE: CRITERIA FOR [SG] COURSES BEGIN ON PAGE 4. | | | |

| III. - [SQ] COURSES MUST ALSO MEET THESE ADDITIONAL CRITERIA: | | | |
|---|--------------------------|--|--|
| <input type="checkbox"/> | <input type="checkbox"/> | A. Provides a substantial, quantitative introduction to fundamental principles governing behavior of matter and energy, in physical or biological systems. | |
| | | B. Includes a college-level treatment of some of the following topics (check all that apply below): | |
| <input type="checkbox"/> | <input type="checkbox"/> | a. Atomic and molecular structure | |
| <input type="checkbox"/> | <input type="checkbox"/> | b. Electrical processes | |
| <input type="checkbox"/> | <input type="checkbox"/> | c. Chemical processes | |
| <input type="checkbox"/> | <input type="checkbox"/> | d. Elementary thermodynamics | |
| <input type="checkbox"/> | <input type="checkbox"/> | e. Electromagnetics | |
| <input type="checkbox"/> | <input type="checkbox"/> | f. Dynamics and mechanics | |
| [SQ] REQUIREMENTS CANNOT BE MET BY COURSES: | | | |
| • Presenting a qualitative survey of a discipline. | | | |
| • Focusing on the impact of science on social, economic, or environmental issues. | | | |
| • Focusing on a specific or limiting but in-depth theme suitable for upper-division majors. | | | |

Proposer: Please complete the following section and attach appropriate documentation.

| ASU--[SG] CRITERIA | | | |
|--|--------------------------|---|----------------------------------|
| I. - FOR ALL <i>GENERAL</i> [SG] NATURAL SCIENCES CORE AREA COURSES, THE FOLLOWING ARE CRITICAL CRITERIA AND MUST BE MET: | | | |
| YES | NO | | Identify Documentation Submitted |
| <input type="checkbox"/> | <input type="checkbox"/> | 1. Course emphasizes the mastery of basic scientific principles and concepts. | |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Addresses knowledge of scientific method. | |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Includes coverage of the methods of scientific inquiry that characterize the particular discipline. | |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. Addresses potential for uncertainty in scientific inquiry. | |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. Illustrates the usefulness of mathematics in scientific description and reasoning. | |
| <input type="checkbox"/> | <input type="checkbox"/> | 6. Includes weekly laboratory and/or field sessions that provide hands-on exposure to scientific phenomena and methodology in the discipline, and enhance the learning of course material. | |
| <input type="checkbox"/> | <input type="checkbox"/> | 7. Students submit written reports of laboratory experiments for constructive evaluation by the instructor. | |
| <input type="checkbox"/> | <input type="checkbox"/> | 8. Course is general or introductory in nature, ordinarily at lower-division level; not a course with great depth or specificity. | |
| II. - AT LEAST ONE OF THE ADDITIONAL CRITERIA THAT MUST BE MET WITHIN THE CONTEXT OF THE COURSE: | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | A. Stresses understanding of the nature of basic scientific issues. | |
| <input type="checkbox"/> | <input type="checkbox"/> | B. Develops appreciation of the scope and reality of limitations in scientific capabilities. | |
| <input type="checkbox"/> | <input type="checkbox"/> | C. Discusses costs (time, human, financial) and risks of scientific inquiry. | |

| [SG] REQUIREMENTS CANNOT BE MET BY COURSES: | | |
|--|---|--|
| | <ul style="list-style-type: none">• Presenting a qualitative survey of a discipline. | |
| | <ul style="list-style-type: none">• Focusing on the impact of science on social, economic, or environmental issues. | |
| | <ul style="list-style-type: none">• Focusing on a specific or limiting but in-depth theme suitable for upper-division majors. | |