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Course Approval

Approved 1/31/75

74-5/25 ⁽¹²⁾

Department Physical Science

Title Solar System Astrophysics

Sponsor(s) Dr. Keith R. Honey No. of Credits Three (3)

Approved by the department Graduate

Not recommended by the department Undergraduate

Information copies forwarded: Academic Dean; Chairman; Curriculum Committee

Signature: Department Chairman

ACADEMIC DEAN

Course syllabus received

Approved as submitted. Returned to department; open hearing authorized

Approved as revised. Returned to department for concurrence

Returned to department for revision

Comments:

Alced Dean 4/14/75
Signature: Academic Dean

OPEN HEARING

Assigned by
Curriculum Committee

Forwarded to the Curriculum Committee for review

Copies of proposal forwarded to Curriculum Committee members

Open hearing held by the department

Referred to the Academic Dean for the following reason(s):

need 4/15
5/22/75
2004/1/6

Signature: Department Chairman

Signature: Reviewer, Curriculum Committee

G L A S S B O R O S T A T E C O L L E G E

PHYSICAL SCIENCE DEPARTMENT

COURSE PROPOSAL

I. Identification of the Proposal

Title of the Course: Solar System Astrophysics
Department: Physical Science
Sponsor: Dr. Keith R. Honey, Assistant Professor

II. Essence

1. Undergraduate course (upper division)
2. Three (3) semester credit hours
3. Course will be offered at Junior-Senior level (1911.320) as free elective.
4. Prerequisites: Physics II, Calculus II
5. The proposed course will be offered as a follow-up course to the elementary astronomy course now being taught in the Physical Science Department. It is intended, however, that the proposed course will be more rigorous both mathematically and physically than the elementary course. The proposed course will be theoretical in its approach and, thus, it should complement well the course in the Methods of Observational Astronomy now being taught by Profs. W. C. Woods, Jr. and Donald A. Farnelli of our department.

The proposed course should also provide an upper-division course for physics and earth science students in particular, and for anyone majoring in physical science and mathematics in general.

6. It is intended that the proposed course be offered for the first time during the Spring Semester of the 1975-76 academic year.

III. Other Details

1. The sponsor of this course has a B.S. in physics, an M.S. in astronomy, and the Ph.D. in physics. For the master's thesis, the sponsor made an observational study of certain RR Lyrae-type variable stars using the 24-inch reflecting telescope at the University of Iowa Observatory.

For the doctoral dissertation, the sponsor made a theoretical investigation of the properties of rotating white dwarf stars. It is felt that this background in both the observational and theoretical aspects of astronomy-astrophysics qualifies the sponsor to teach the proposed course.

In addition, there are individuals in the Physical Science Department who have, at one time or another, taught the course in elementary astronomy for periods of time ranging up to eight years. These individuals would, if the need arose, be available for discussions involving both the possible content of the course and questions concerning some of the concepts with which it might deal. Further, there are members of the physics group who would also be available for such discussions.

2. No special equipment needs are foreseen at this time. The telescopes and accessories now available in our department should be adequate for supplementing any of the observational aspects of solar system astrophysics which might be discussed.

The sponsor would request that certain references to be used as outside reading in the course be placed on reserve in the Savitz Learning Resource Center. Some of these references are now available in the SLRC and others would have to be ordered.

Educational aids which might be needed (in addition to those now available) would possibly be certain films and/or slide sets. These would be requested as needed.

The classroom and/or laboratory space now available in Bosshart Hall would be entirely adequate for conducting the proposed course.

3. The proposed course is seen as unique in the sense that it would offer the interested student an opportunity to obtain an understanding of astronomy-astrophysics which would be both deeper and more complete than that provided by the present descriptive course. The typical course in elementary astronomy, is, by necessity, primarily informational in emphasis. The proposed course is seen as a means by which the student may learn both why and how the astronomer tries to learn something about the nature of the solar system. It is suggested that this will be accomplished by a detailed development of the mathematical and physical principles of the concepts which underlie our current understanding of this system.

By necessity, the science of astronomy draws heavily upon the sciences of physics and mathematics. The proposed course in solar system astrophysics would, however, overlap courses in either of these areas only to the extent that those mathematical and physical concepts essential to the course would be developed.

4. The most general objective of the proposed course would be as follows:

- I. Aspects of the Celestial Sphere
- II. Celestial Mechanics
- III. Motions of the Earth
- IV. The Solar System in Perspective

V. The Earth-Moon System

VI. A Detailed Look at the Planets

VII. Electromagnetic Radiation and Matter

VIII. The Sun

The mode of presentation in the course would be primarily that of the lecture, these lectures being supplemented when necessary by demonstrations, experiments, discussion, slide sets, and/or films. Students will be expected to attend class regularly. Periodic homework assignments will be made, and quizzes (both announced and unannounced) will be given. In addition, there will be periodic announced examinations. Evaluation of the students will be based upon their performance on these homework assignments, quizzes, and examinations.

- IV. Student enrollment in the astronomy course during the past few years would indicate a substantial interest in at least its elementary aspects. From conversations with students and with other members of the Physical Science Department, the sponsor has gained the impression that many of these students would be interested in following up an introduction to astronomy with a more advanced course. Thus, the proposed course would provide an advanced course offering for those students interested in astronomy. In talking with other members of the physics group (of which the sponsor is a member), it has been learned that there is definite need for another upper-division course offering for those students who are majoring in physical science with either physics or earth science concentration. From the standpoint of both content and level of approach, it is foreseen that the proposed course will fill such a need.

During the past Fall semester, Profs. Woods and Farnelli offered a course in the methods of observational astronomy. In terms of student enrollment, the response to this course has been good. There were 25 students enrolled in both the past and current semesters. The proposed course is seen as one which, because of its emphasis on theory, will complement well the course in which the emphasis is on observation. Thus, students who complete the elementary course in astronomy would have two courses available at an advanced level.

V. Additional Remarks

A catalogue description of the proposed course follows:

SOLAR SYSTEM ASTROPHYSICS (1911.320)

Prerequisites: Calculus II, Physics II

This course emphasizes the mathematical and physical principles of the concepts underlying our current understanding of the solar system. Topics to be discussed include electromagnetic radiation, the atomic nature of matter, celestial coordinate systems, motions of the planets and the sun, overall composition of the solar system, the earth-moon system, and the atmospheric composition and internal structure of the planets and the sun.

A bibliography for the proposed course follows:

- * 1. Abell, G. O., Exploration of the Universe, 3rd edition, New York: Holt, Rinehart and Winston, 1974.
- + 2. Aller, L. H., Astrophysics, 2nd edition. New York: The Ronald Press Company, 1963.
- # 3. Blanco, V. M. & S. W. McCuskey, Basic Physics of the Solar System. Reading, Mass. : Addison-Wesley Publishing Co., 1961.
- + 4. Brandt, J. O. & P. W. Hodge, Solar System Astrophysics, New York: McGraw-Hill Book Company, Inc., 1964.
- ** 5. Firsoff, V. A., The Interior Planets. London: Oliver and Bodys, 1968.
- ** 6. Gamow, G., A Star Called the Sun. New York: Bantam Books, Inc., 1970.
- ** 7. Gamow, G., A Planet Called the Earth, New York: Bantam Books, Inc., 1970.
- # 8. Motz, L. & A. Duveen, Essentials of Astronomy. Belmont, Calif.: Wadsworth Publishing Company, Inc., 1966
- ** 9. Smith, A. G. & T. D. Carr, Radio Exploration of the Planetary System. Princeton: D. Van Nostrand Company, Inc., 1964.
- ** 10. Smith, E. & K. C. Jacobs, Introductory Astronomy and Astrophysics., Philadelphia: W. E. Saunders Company, 1973.
- # 11. Swihart, T. L., Astrophysics and Stellar Astronomy, New York: John Wiley & Sons, Inc., 1968.
- ***12. van de Kamp, P., Elements of Astromechanics , San Francisco: W. H. Freeman and Company, 1964.
- # 13. Wyatt, S. P., Principles of Astronomy, 2nd edition. Boston: Allyn and Bacon, Inc., 1971.

This proposal was prepared following consultation with the following members of the Physical Science Department:

Dr. Lawrence J. Delaney, Head of Physics Group
Dr. Alex Borowec
Prof. W. C. Woods, Jr.
Prof. C. Joseph Waring, Head of Earth Science Group

Note: # = texts available in Savitz Learning Resource Center
* = textbook for the course
** - paper back books
+ - will recommend for purchase by SLRC