|  |  |
| --- | --- |
| **Course Title:** | **Spherical Astronomy (2)** |
| **Course Code:** | **ASTR 432** |
| **Program:** | **ASTR-MATH** |
| **Department:** | **Astronomy** |
| **College:** | **Science** |
| **Institution:** | **King AbdulAziz University** |

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# A. Course Identification

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1. Credit hours:** | | | |  | | | | | | | | | | | | |
| **2. Course type** | | | | | | | | | | | | | | | | |
| **a.** | University | |  | | College | | |  | Department | | | | **✓** | Others |  |  |
| **b.** | | Required | | | | **✓** | Elective | | |  |  | | | | | |
| **3. Level/year at which this course is offered:** | | | | | | | | | | | | **7th Level / 4th Year** | | | | |
| **4. Pre-requisites for this course** (if any)**: ASTR 331** | | | | | | | | | | | | | | | | |
| **5. Co-requisites for this course** (if any)**: None** | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |

## 6. Mode of Instruction (mark all that apply)

| **No** | **Mode of Instruction** | **Contact Hours** | **Percentage** |
| --- | --- | --- | --- |
| **1** | **Traditional classroom** | **3** | **100%** |
| **2** | **Blended** |  |  |
| **3** | **E-learning** |  |  |
| **4** | **Correspondence** |  |  |
| **5** | **Other** |  |  |

**7. Actual Learning Hours** (based on academic semester)

|  |  |  |
| --- | --- | --- |
| **No** | **Activity** | **Learning Hours** |
| **Contact Hours** | | |
| **1** | **Lecture** | **30** |
| **2** | **Laboratory/Studio** |  |
| **3** | **Tutorial** | **15** |
| **4** | **Others** (specify) |  |
|  | **Total** | **45** |
| **Other Learning Hours\*** | | |
| **1** | **Study** | **60 (minimum)** |
| **2** | **Assignments** | **20** |
| **3** | **Library** |  |
| **4** | **Projects/Research Essays/Theses** | **10** |
| **5** | **Others** |  |
|  | **Total** | **90** |

**\*** The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

# B. Course Objectives and Learning Outcomes

|  |
| --- |
| 1. Course Description This course contains the following subjects: Occultation of the stars by the moon. Computational methods for the occultation. Solar and lunar eclipses. Proper motions of stars. Processional changes in proper motion. Methods for measuring stellar parallax and motions. Galactic coordinates. The effect of galactic coordinates on stellar proper motions. Applications of positional astronomy in navigation. |
| 2. Course Main Objective The main objective of this course is the student acquires knowledge of the following topics:   * Apply the mathematical relations of the spherical trigonometry for positional astronomy. * Methods for measuring stellar parallax and motions. * Computational methods of occultation and proper motions. * Solar and lunar eclipses. * The positional astronomy in marine and space navigation. |
|  |

## 

## 3. Course Learning Outcomes

| **CLOs** | | **Aligned****PLOs** |
| --- | --- | --- |
| 1 | **Knowledge:** |  |
| 1.1 | Define the occultation and proper motion. | K1, K9 |
| 1.2 | Define the Galactic coordinates. | K9, K10 |
| 1.3 | Describe the methods for measuring stellar parallax and motions. | K2, K6, K10 |
| 1.4 | Describe the solar and lunar eclipses. | K2, K6, K10 |
| **2** | **Skills :** |  |
| 2.1 | Interpret the way for determining the stellar proper motion | S5, S11 |
| 2.2 | Explain the different types of solar eclipse. | S7, S11 |
| 2.3 | Explain the different types of lunar eclipse. | S7, S11 |
| 2.4 | Illustrate the computational methods for the occultation. | S9, S11 |
| 2.5 | Show the applications of positional astronomy in space navigation | S2, S9, S11 |
| 2.6 | Show the applications of positional astronomy in marine navigation | S2, S9, S11 |
| **3** | **Competence:** |  |
| 3.1 | Working in groups to solve the complicated problems. | C1, C3, C4 |

# C. Course Content

|  |  |  |
| --- | --- | --- |
| **No** | **List of Topics** | **Contact Hours** |
| 1 | Occultation.  Tutorial 1: Occultation. | 3 |
| 2 | Computational methods for the occultation  Tutorial 2: Computational methods for the occultation. | 3 |
| 3 | Solar and lunar eclipses.  Tutorial 3: Solar and lunar eclipses I. | 3 |
| 4 | Solar and lunar eclipses.  Tutorial 4: Solar and lunar eclipses II. | 3 |
| 5 | Proper motions of stars.  Tutorial 5: Proper motions of stars. | 3 |
| 6 | Processional changes in proper motion.  Tutorial 6: Processional changes in proper motion. | 3 |
| 7 | Methods for measuring stellar parallax and motions.  Tutorial 7: Methods for measuring stellar parallax and motions. | 3 |
| 8 | Galactic coordinates.  Tutorial 8: Galactic coordinates. | 3 |
| 9 | The effect of galactic coordinates on stellar proper motions.  Tutorial 9: The effect of galactic coordinates on stellar proper motions I. | 3 |
| 10 | The effect of galactic coordinates on stellar proper motions.  Tutorial 10: The effect of galactic coordinates on stellar proper motions II. | 3 |
| 11 | Applications of positional astronomy in marine navigation  Tutorial 11: Applications of positional astronomy in marine navigation I. | 4 |
| 12 | Applications of positional astronomy in marine navigation  Tutorial 12: Applications of positional astronomy in marine navigation II. | 4 |
| 13 | Applications of positional astronomy in space navigation  Tutorial 13: Applications of positional astronomy in space navigation I. | 3 |
| 14 | Applications of positional astronomy in space navigation  Tutorial 14: Applications of positional astronomy in space navigation II. | 4 |
|  |  |  |
| **Total** | | **45** |

# D. Teaching and Assessment

## 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| **Code** | **Course Learning Outcomes** | **Teaching Strategies** | **Assessment Methods** |
| --- | --- | --- | --- |
| **1.0** | **Knowledge** | | |
| 1.1 | Define the occultation and proper motion. | Lectures | Quizzes, Homework, Exams |
| 1.2 | Define the Galactic coordinates. |
| 1.3 | Describe the methods for measuring stellar parallax and motions. |
| 1.4 | Describe the solar and lunar eclipses. |
| **2.0** | **Skills** | | |
| 2.1 | Interpret the way for determining the stellar proper motion | Lectures & tutorials | Quizzes, Homework, Exams |
| 2.2 | Explain the different types of solar eclipse. |
| 2.3 | Explain the different types of lunar eclipse. |
| 2.4 | Illustrate the computational methods for the occultation. |
| 2.5 | Show the applications of positional astronomy in space navigation |
| 2.6 | Show the applications of positional astronomy in marine navigation |
| **3.0** | **Competence** | | |
| 3.1 | Working in groups to solve the complicated problems. | Group discussion | Exams |

## 

## 2. Assessment Tasks for Students

| **#** | **Assessment task\*** | **Week Due** | **Percentage of Total Assessment Score** |
| --- | --- | --- | --- |
| **1** | Assignments + Homework | weekly | 10% |
| **2** | Major exams I | 6th | 15% |
| **4** | Major exams II | 12th | 15% |
| **5** | Tutorial | weekly | 20% |
| **6** | Final Exam | 15th | 40% |

**\*Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

# E. Student Academic Counseling and Support

|  |
| --- |
| **Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :** |
| Office hours: 3 hours per week |

# F. Learning Resources and Facilities

## 1.Learning Resources

|  |  |
| --- | --- |
| **Required Textbooks** | * Lectures notes. * A Guide to the celestial sphere: 1996, James, B. Kaler. Amazon, USA. * Nautical Almanac and Astronomical Ephemeris (The newest version). |
| **Essential References Materials** | **-**  Spherical Astronomy: R. Green, Cambridge University Press, 1985.  - Computational Spherical Astronomy: L.G. Taff, John Wiley and Sons, 1981.   * Text-Book on Spherical Astronomy: W. M. Smart, Cambridge, 1965. |
| **Electronic Materials** | The sites for the catalogues for the celestial objects. |
| **Other Learning Materials** | * Starry-night software Program. * Mathematica programing Language. |

## 2. Facilities Required

| **Item** | **Resources** |
| --- | --- |
| **Accommodation**  (Classrooms, laboratories, demonstration rooms/labs, etc.) | Class room with 15 seats, Computer Lab |
| **Technology Resources**  (AV, data show, Smart Board, software, etc.) | Data show |
| **Other Resources**  (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | Mathematica software |

# G. Course Quality Evaluation

| **Evaluation**  **Areas/Issues** | **Evaluators** | **Evaluation Methods** |
| --- | --- | --- |
| Course contents | Students | Course evaluation questionnaire (Direct) |
| Learning resources and equipment | Students | Student experience questionnaire (Direct) |
| Effectiveness of teaching and assessment | Students | Student experience questionnaire (Direct) |
| Course contents and materials | Faculty members | By department council discussion (Indirect) |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

**Assessment Methods** (Direct, Indirect)

# H. Specification Approval Data

|  |  |
| --- | --- |
| **Council / Committee** |  |
| **Reference No.** |  |
| **Date** | September 2017 |