|  |  |
| --- | --- |
| **Course Title:**  | **Spherical Astronomy (1)** |
| **Course Code:** | **ASTR 331** |
| **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:** | **5th Level / 3rd Year** |
| **4. Pre-requisites for this course** (if any)**: ASTR 202 & MATH 202** |
| **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** | **30** |
| **3** | **Library** |  |
| **4** | **Projects/Research Essays/Theses**  |  |
| **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: Spherical trigonometry. Celestial coordinate systems and the transformations between them. Time and seasons. Refraction. Aberration. Parallax. Precession and mutation. The effects of the various factors on the observational astrometry. Computational algorithms of the daily astronomical phenomena (Sunrise, Sunset, Twilight). Some applications of the spherical astronomy in the geodetic science. The geocentric motion of a planet. The phase of the planets and the Moon. Position angle of the Sun's axis of rotation. The heliocentric coordinates of a Sun-spot. |
| 2. Course Main ObjectiveTo give the students bases for determining the positions of the celestial bodies relative to fundamental plans |
|  |

##

## 3. Course Learning Outcomes

| **CLOs** | **Aligned****PLOs** |
| --- | --- |
| 1 | **Knowledge:** |  |
| 1.1 | Describe the apparent motion of the celestial objects in sky. | K1 |
| 1.2 | List the different kind of astronomical coordinate systems.  | K9, K10 |
| 1.3 | Drive the relation between the different coordinate systems. | K9, K10 |
| 1.4 | Define the refraction, aberration and parallax | K9 |
| 1.5 | Describe the precession and nutation phenomena  | K9 |
| 1.6 | Outline the phases of the Moon | K3, K11 |
| **2** | **Skills :** |  |
| 2.1 | Illustrate the difference between the true and apparent motions of celestial object. | S5 |
| 2.2 | Explain how to use the spherical geometry to understand the apparent motion on the sky. | S7, S11 |
| 2.3 | Explain how to use mathematical skills to formulate astronomical laws. | S9 |
| 2.4 | Compare between the precession and nutation phenomena. | S11 |
| 2.5 | Compare between geocentric and heliocentric coordinates. | S11 |
| 2.6 | Show how to use the astronomical catalogs and software packages for different purposes. | S13, S14 |
| **3** | **Competence:** |  |
| 3.1 | Working in groups to solve the complicated problems. | C1, C3 |

# C. Course Content

|  |  |  |
| --- | --- | --- |
| **No** | **List of Topics** | **Contact Hours** |
| 1 | Spherical trigonometry.Tutorial 1: Spherical trigonometry | 5 |
| 2 | Celestial coordinate systems and its transformationsTutorial 2: Celestial coordinate systems and its transformations | 5 |
| 3 | Time and seasonsTutorial 3: Time and seasons | 5 |
| 4 | Refraction, Aberration and Parallax.Tutorial 4: Refraction, Aberration and Parallax. | 5 |
| 5 | Precession and mutation.Tutorial 5: Precession and mutation | 5 |
| 6 | The effects on the observational astrometryTutorial 6: The effects on the observational astrometry | 4 |
| 7 | The geocentric motion of a planet.Tutorial 7: The geocentric motion of a planet. | 4 |
| 8 | The heliocentric coordinates of a Sun-spotTutorial 8: The heliocentric coordinates of a Sun-spot | 4 |
| 9 | The phases of the planets and the MoonTutorial 9: The phases of the planets and the Moon | 4 |
| 10 | Applications of the spherical astronomy in the geodetic scienceTutorial 10: Applications of the spherical astronomy in the geodetic science | 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 | Describe the apparent motion of the celestial objects in sky. | Lectures  | Quizzes, Homework, Exams |
| 1.2 | List the different kind of astronomical coordinate systems.  |
| 1.3 | Drive the relation between the different coordinate systems. |
| 1.4 | Define the refraction, aberration and parallax |
| 1.5 | Describe the precession and nutation phenomena  |
| 1.6 | Outline the phases of the Moon |
| **2.0** | **Skills** |
| 2.1 | Illustrate the difference between the true and apparent motions of celestial object. | Lectures & tutorials | Quizzes, Homework, Exams |
| 2.2 | Explain how to use the spherical geometry to understand the apparent motion on the sky. |
| 2.3 | Explain how to use mathematical skills to formulate astronomical laws. |
| 2.4 | Compare between the precession and nutation phenomena. |
| 2.5 | Compare between geocentric and heliocentric coordinates. |
| 2.6 | Show how to use the astronomical catalogs and software packages for different purposes. |
| **3.0** | **Competence** |
| 3.1 | Working in groups to interchange the student's skills. | 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** | - A Guide to the celestial sphere: 1996, James, B. Kaler. Amazon, USA.- Astronomy on the personal computer: 2000. 4th edition. T. Pfleger. Springer, Germany. |
| **Essential References Materials** | **-**  Spherical Astronomy: R. Green, Cambridge University Press, 1985.- Computational Spherical Astronomy: L.G. Taff, John Wiley and Sons, 1981. |
| **Electronic Materials** | - Starry-night software Program. |
| **Other Learning Materials** | Nautical Almanac and Astronomical Ephemeris. |

## 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) |  |

# 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 |