|  |  |
| --- | --- |
| **Course Title:** | **Binary and Variable Stars** |
| **Course Code:** | **ASTR 321** |
| **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:** | | | | | | | | | | | | **6th Level / 3rd Year** | | | | |
| **4. Pre-requisites for this course** (if any)**: ASTR 351** | | | | | | | | | | | | | | | | |
| **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** | **2** | **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** |  |
| **4** | **Others** (specify) |  |
|  | **Total** | **30** |
| **Other Learning Hours\*** | | |
| **1** | **Study** | **45 (minimum)** |
| **2** | **Assignments** | **15** |
| **3** | **Library** |  |
| **4** | **Projects/Research Essays/Theses** |  |
| **5** | **Others** |  |
|  | **Total** | **60** |

**\*** 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: The classification of Binary stars – orbital parameters – visual binary – eclipsing binary stars (determine the orbital parameters, light curves) – spectral binary stars (determine the orbital parameters, velocity curves) – X binary stars. The classification of variables and technique of observation. Semi regular and irregular variables. Location of variables on H-R diagram. Periodical analysis of light curves for different variables. Analysis of the observational data to detect some experimental relations for variable stars. The importance of variable stars in cosmic studies. |
| 2. Course Main Objective The aim of this course is to study the physical properties and the classifications of variable and binary stars and its importance in the astronomical studies. |
|  |

## 3. Course Learning Outcomes

| **CLOs** | | **Aligned****PLOs** |
| --- | --- | --- |
| 1 | **Knowledge:** |  |
| 1.1 | Describe the astronomical and mathematical facts about binary and variable stars. | K1 |
| 1.2 | List the types and main characteristics of variable and binary stars. | K3, K9 |
| 1.3 | State the different telescopes and instruments that use for observing binary and variable stars | K5 |
| 1.4. | Describe methods commonly used to determine the parameters of variable and binary stars. | K11 |
| **2** | **Skills :** |  |
| 2.1 | Use observational data and theoretical models to build and derive the elements of light curve for variable and binary stars. | S1, S6 |
| 2.2 | Compare between radial velocity and light curve of different types of variable and binary stars and classify them. | S9, S11 |
| 2.3 | Use light curve analysis software to study binary and variable stars | S14 |
| **3** | **Competence:** |  |
| 3.1 | Ability to apply the light curve to derive the binary star parameters | C3, C4 |

# C. Course Content

|  |  |  |
| --- | --- | --- |
| **No** | **List of Topics** | **Contact Hours** |
| 1 | The classification and naming of variable and binary stars. | 5 |
| 2 | Observing and Measuring Visual techniques and its orbital elements. | 5 |
| 3 | The types and physical properties of the rotating variable stars. | 5 |
| 4 | The classifications and physical properties of eclipsing, spectroscopic binaries and pulsars. | 5 |
| 5 | The physical properties and types of pulsating stars. | 5 |
| 6 | Converting your observations into light curves. | 5 |
| **Total** | | **30** |

# 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 astronomical and mathematical facts about binary and variable stars. | Lectures & whiteboard. | Quizzes, Homework, Exams |
| 1.2 | List the types and main characteristics of variable and binary stars. |
| 1.3 | State the different telescopes and instruments that use for observing binary and variable stars |
|  | Describe methods commonly used to determine the parameters of variable and binary stars. |
| **2.0** | **Skills** | | |
| 2.1 | Use observational data and theoretical models to build and derive the elements of light curve for variable and binary stars. | Lectures & whiteboard. | Quizzes, Homework, Exams |
| 2.2 | Compare between radial velocity and light curve of different types of variable and binary stars and classify them. |
| 2.3 | Use light curve analysis software to study binary and variable stars |
| **3.0** | **Competence** | | |
| 3.1 | Ability to apply the light curve to derive the binary star parameters | Oral discussion | Exams |

## 

## 2. Assessment Tasks for Students

| **#** | **Assessment task\*** | **Week Due** | **Percentage of Total Assessment Score** |
| --- | --- | --- | --- |
| **1** | Exam I | 4th | 20% |
| **2** | Exam II | 10th | 20% |
| **4** | Homework | 2-14th | 10% |
| **5** | Quiz | 2-14th | 10% |
| **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** | * Eclipsing Binary Stars, J. Kallarathand, E.F. Milonc, 1999. * Variable Stars, Strohmeier, W.1972. |
| **Essential References Materials** |  |
| **Electronic Materials** | <https://www.aavso.org/types-variables>  <http://www.midnightkite.com/index.aspx?URL=Binary> |
| **Other Learning Materials** | Handouts |

## 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 |