**Plan of Studies in Physics /Astronomy**

Requirements for earning Science B.S.c in Physics/ Astronomy are to achieve 128 units accepted with a grade not less than (2) contain:

|  |  |  |
| --- | --- | --- |
| **Requirements** | **Units** | **Remarks** |
| University requirements | 26 | As shown in university requirements |
| First year requirements of natural science students | 15 | As shown in first year requirements of Natural Science students |
| College requirements | 9 | As shown in faculty requirements |
| Department requirements | 72 | 31 | Compulsory Astronomy Department requirements |
| 25 | Compulsory Physics Department requirements |
| 3 | Compulsory Math & Statics Department requirements |
| 13 | Elective Astronomy &Physics Department |
| Elective requirements | 6 | Other department |
| **Total** | **128** |  |

\* Faculty Requierments:

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **Code & NO** | **Pre-requisites** |
| ASTR200 | Laboratory Safety | ASTR200 | - |
| Astr 201 | Genral Astronomy | ASTR 201 | - |
| Astr 390 | Summer training | ASTR 390 | - |
| BIO281 | Biology Lab. |  |  |
| PHYS 281 | Physics Lab. |  |  |

### Physics /Astronomy major requirements :

Student studies 72 units from astronomy Physics, and mathematic department as shown:

#### a- 27 units Compulsory from Astronomy Courses:

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
| Astr 202 | General Astronomy (2) | 3 | 3 | 4 | Astr 201 |
| Astr 211 | Telescopes & Accessories | 2 | 3 | 3 | Astr 201, Phys 110 |
| Astr 304 | Computer Applications | 2 | 3 | 3 | Astr202, Phys202 |
| Astr 321 | Variable & binary Stars | 2 | - | 2 | Astr 351 |
| Astr 331 | Spherical Astronomy (1) | 2 | 3 | 3 | Astr 202, Math 202 |
| Astr 351 | Stellar Radiation and Characteristics | 2 | 3 | 3 | Astr 202, Phys 202 |
| Astr 361 | Radio Astronomy | 2 | - | 2 | Astr 211, 351 |
| Astr 371 | Physics of Solar System | 2 | - | 2 | Astr 202 |
| Astr 391 | Scientific terminology | 2 | - | 2 | - |
| Astr 422 | Space physics | 2 | 3 | 3 | Astr 331 |
|  | Total Units |  |  | 27 |  |

**b- 25 units Compulsory from Physics Courses as follows:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
| Phys 202 | General Physics (2) | 3 | 3 | 4 | Phys 110, Math 110 |
| Phys 203 | General Physics (3) | 3 | 3 | 4 | Phys 110, Math 110 |
| Phys 241 | Modern Physics (1) | 3 | - | 3 | Phys 202, Math 202 |
| Phys 251 | Methods of theory. Phys (1) | 4 | - | 4 | Math 202 |
| Phys252 | Classical mechanics (1) | 3 | - | 3 | Phys 110,Math 202 |
| Phys 331 | Electricity & Magnetism (1) | 3 | - | 3 | Phys 202,Phys 251 |
| Phys 351 | Modern Physics (2) | 4 | - | 4 | Phys 251 |
|  | Total Units |  |  | 25 |  |
|  |  |  |  |  |  |

**c- 3 units Compulsory from Mathematics & Static Courses:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
| Math 204 | Ordinary Differential Eqs. (1) | 3 | - | 3 | Math 202 |
|  | Total |  |  | 3 |  |

d-**6 Units from Astronomy Courses (Elective):**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
| Astr 203 | History of Astronomy | 3 | - | 3 |  |
| Astro 341 | Celestial Mechanics (1) | 3 | - | 3 |  |
| Astr 352 | Stellar Atmospheres | 3 | - | 3 | Astr 351 |
| Astr453 | Stellar Interior | 2 | - | 2 | Astr 352 |
| Astr 472 | Solar Physics | 1 | 3 | 2 | Astr 371,352 |
| Astr 481 | Galaxies | 3 | - | 2 | Stat 201,Astr 351 |

1. **7 Units from Physics Courses (Elective):**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
| Phys 221 | Thermodynamics | 3 | - | 3 | Phys 103, Math 202 |
| Phys 342 | Modern Physics (2)\* | 3 | - | 3 | 4 | Phys 252,251,241 |
| Phys 381 | Modern Physics Lab\* | - | 3 | 1 | Phys 241 |
| Phys 343 | Special Relativity | 3 | - | 3 | Phys 241 |
| Phys 353 | Classical Mechanics (2) | 3 | - | 3 | Phys 252 |
| Phys 311 | Optics\* | 3 | - | 3 | 4 | Phys 241 |
| Phys 383 | Optics lab\* | - | 3 | 1 | Phys 311 |
|  | Totlal |  |  | 7 |  |

\* Must be registered with lab

#### Training Course (astr 390)(2 units):

**A new course added recently to train students for 6 weeks in the summer season which is spent at the department under the supervision of an academic supervisor:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **Units** | **Pre-requisites** |
| Astr 390 | Training (1) | 2 | - |

1. **Elective courses from other departments (6 units):**

Students choose elective courses under supervision of their academic supervisor that helps with their studying courier

## Plan of Studies in Mathematics/ Astronomy

Requirements for earning Science B.S.c in Mathematics /Astronomy are to achieve 128 units accepted with a grade not less than (2) contain:

|  |  |  |
| --- | --- | --- |
| **Requirements** | **Units** | **Remarks** |
| University requirements | 26 | As shown in university requirements |
| First year requirements of natural science students | 15 | As shown in first year rquierments of Natrual Science students |
| College requirements | 9 | As shown in faculty requirements |
| Department requirements | 72 | 32 | Compulsory Astronomy Department requirements |
| 19 | Compulsory Math Department requirements |
| 4 | Compulsory Math & Static Department requirements |
| 17 | Elective Astronomy &Math Department |
| Elective requirements | 6 | Other department |
| **Total** | **128** |  |

\* Faculty Requirements:

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **Code & NO** | **Pre-requisites** |
| ASTR200 | Laboratory Safety | ASTR200 | - |
| MATH 202 | MATHMATICS 202 | MATH 202 | MATH 201 |
| Astr 390 | Summer training | Astr 390 | - |
| BAIO 281 | Baiology Lab. |  | - |
| PHYS 281 | Physics Lab. |  | - |

### Mathematics /Astronomy major requirements:

Student studies 72 units from astronomy and mathematic department as shown:

#### a- 28 units Compulsory from Astronomy Courses:

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
| Astr 202 | General Astronomy (2) | 3 | 3 | 4 | Astr 201 |
| Astr 211 | Telescopes & Accessories | 2 | 3 | 3 | Astr 201, Phys 110 |
| Astr 304 | Computer Applications | 2 | 3 | 3 | Astr202, Phys202 |
| Astr 321 | Binary and Variable Stars | 2 | - | 2 | Astr 351 |
| Astr 331 | Spherical Astronomy (1) | 2 | 3 | 3 | Astr 202, Math 202 |
| Astr 341 | Celestial Mechanics (1) | 3 | - | 3 | Astr 331 |
| Astr 351 | Stellar Radiation and Characteristics | 2 | 3 | 3 | Astr 202, Phys 202 |
| Astr 371 | Physics of Solar System | 2 | - | 2 | Astr 202 |
| Astr 391 | Scientific terminology | 2 | - | 2 | - |
| Astr 432 | Spherical Astronomy (2) | 2 | 3 | 3 | Astr 331 |
|  | Total Units |  |  | 28 |  |

**b- 19 units Compulsory from Mathematics Courses as follows:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
| Math 203 | Calculus (3) | 3 | 2 | 4 | Math 202 |
| Math 241 | Linear Algebra | 3 | - | 3 | Math 110 |
| Math 251 | Foundations of Mathematics | 3 | - | 3 | Math 110 |
| Math 261 | Analytic Geometry | 3 | - | 3 | Math 110 |
| Math 204 | Ordinary Differential Eqs.(1) | 3 | - | 3 | Math 203 |
| Math 311 | Real Analysis (1) | 3 | - | 3 | Math 202 |
|  |  |  |  |  |  |
|  | Total Units |  |  | 19 |  |

**c- 4 units Compulsory from Physics & Static Courses:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
| Phys 202 | General Physics (2) | 3 | 3 | 4 | Phys 110, Math 110 |
|  | Total Units |  |  | 4 |  |

d-**8 Units from Astronomy Courses (Elective):**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
| Astro 203 | History of Astronomy | 3 | - | 3 | - |
| Astr 352 | Stellar Atmospheres | 2 | - | 2 | Astr 351 |
| Astr453 | Stellar Interior | 2 | - | 2 | Astr 352 |
| Astr 472 | Solar Physics | 2 | 3 | 2 | Astr 371,352 |
| Astr 442 | Celestial Mechanics (2) | 2 | - | 2 | Astr 341 |
| Astr 481 | Galaxies | 2 | - | 2 | Stat 201,Astr 351 |

* 1. **9 Units from Math Courses (Elective):**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
| Math 305 | Ordinary Differential Eqa. (1) | 3 | - | 3 | Math 204 |
| Math 312 | Real Analysis (2) | 3 | - | 3 | Math 311 |
| Math 332 | Applied Mathematics | 3 | - | 3 | Math 203 |
| Math 342 | Abstract Algebra(1) | 3 | - | 3 | Math 251 |
| Math 413 | Complex Analysis | 3 | - | 3 | Math 203,312 |
| Math 463 | Differential Geometry | 3 | - | 3 | Math 203,305 |

* 1. **Training Course (Astr 390) (2 units):**

A new course added recently to train students for 6 weeks in the summer season which is spent at the department under the supervision of an academic supervisor**:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **Units** | **Pre-requisites** |
| Astr 390 | Training (1) | 2 | - |

#### Elective courses from other departments (6 units):

Students choose elective courses under supervision of their academic supervisor that helps with their studying courier

### List of Astronomy Courses

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
| Astr 201 | General Astronomy ( 1) | 3 | 3 | 4 | - |
| Astr202 | General Astronomy ( 2) | 3 | 3 | 4 | Astr 201 |
| Astr203 | History of Astronomy | 3 | - | 3 | - |
| Astr211 | Telescope &accessories | 2 | 3 | 3 | Astr 201,phys 110 |
| Astr230 | Celestial Navigation | 2 | 3 | 3 | - |
| Astr304 | Computer Applications in astronomy | 2 | 3 | 3 | Astr202,Phys202 |
| Astr321 | Variable & Binary Stars | 2 | - | 2 | Astr 351 |
| Astr331 | Spherical Astronomy (1) | 2 | 3 | 3 | Astr202,Math202 |
| Astr341 | Celestial Mechanics (1) | 3 | - | 3 | Astr 331 |
| Astr351 | Stellar Radiate. Char. | 2 | 3 | 3 | Astr202, Phys202 |
| Astr352 | Stellar Atmospheres | 3 | - | 2 | Astr 351 |
| Astr361 | Radio Astronomy | 2 | - | 2 | Astr 211, 351 |
| Astr371 | Physics of Solar System | 2 | - | 2 | Astr 202 |
| Astr390 | Training (1) | 1 | - | 2 | Department approve |
| Astr 391 | Scientific terminology | 2 | - | 2 | - |
| Astr422 | Space Physics | 2 | 3 | 3 | Astr 331 |
| Astr432 | Spherical Astronomy (2) | 2 | 3 | 3 | Astr 331 |
| Astr442 | Celestial Mechanics (2) | 3 | - | 3 | Astr 341 |
| Astr453 | Stellar Interior | 2 | - | 2 | Astr 352 |
| Astr472 | Solar Physics | 1 | 3 | 2 | Astr 371,352 |
| Astr481 | Galaxies | 2 | - | 2 | Stat201,Astr 351 |

**Plan of Studies in Physics /Astronomy First Year for Science Students**

Level 01 (12 units) Level 02(15 units)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course No** | Course Title | Units | **Pre- requisite** |  | **Course No** | Course Title | Units | **Pre- requisite** |
| Math 110 | Calculus | 3 | - |  | STAT 110 | Statistics 1 | 3 | - |
| Phys 110 | General Physics | 3 | - | CHIM 110 | General Chemistry | 3 | - |
| Elc 101\* | English Language 1\* | 3 | - | Elc 102 | English Language 2\* | 3 | Els 101 |
| Cs 100\*\* | Computer \*\* | 3 | - | Comm. 101\* | Communications & skills\* | 3 | - |
| - | - | - | - | Bio 110 | Biology1 | 3 | - |
|  | Total units | 12 |  |  | Total units | 15 |

**\*condensed course no less than 15 units weekly \*condensed course no less than 15 units weekly**

**\*\* Or Communication & skills Comm101 \*\* Or Computer Cs101**

**Level 03 (17 units) Level 04 (16 units)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course No** | **Course Title** | **Units** | **Pre- requisite** |  | **Course No** | **Course Title** | **Units** | **Pre- requisite** |
| Phys202 | General physics 2 | 4 | Phys201 |  | Phys 203 | General physics 3 | 4 | Phys201 & Phys202 |
| Astr 201 | General Astr 1 | 4 | - | Math 204 | Ordinary Differential Eqa. 1 | 3 | Math 202 |
| Math 202 | Calculus 2 | 4 | Math 110 | Astr 202 | General Astronomy 2 | 4 | Astr 201 |
| Isls 101 | Islamic Studies1 | 2 | - | Astr 211 | Telescope &accessories | 3 | Astr 201+phys 110 |
| ARAB101 | ARABIC 1 | 3 | - | Baio281 | Baiology Lab. | 1 | - |
|  |  |  |  | PHYS 281 | Physics Lab. | 1 | - |
|  | Total units | 17 |  | Total units | 16 |

**Level 05 (18 units) Level 06 (16 units)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No** | **Course Title** | **Units** | **Pre- requisite** |
| Astr 304 | Computer Applications in astronomy | 3 | Astr202,Phys202 |
| Astr 351 | Stellar Radiate. Char. | 3 | Astr202,Phys 202 |
| Astr 331 | Spherical Astronomy 1 | 3 | Astr202,Math202 |
| Astr 371 | Physics of Solar System | 2 | Astr 202 |
| Phys 241 | Modern Physics (1) | 3 | Phys 102 Math202 |
| Isls 102 | Islamic Studies 2 | 2 | Isls 201 |
| Astr 361 | Radio Astronomy | 2 | Astr211 &Astr 351 |
|  | Total units | 18 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No** | **Course Title** | **Units** | **Pre- requisite** |
| Astr 321 | Variable & Binary Stars | 2 | Astr 351 |
| Astr 391 | Scientific terminology | 2 | - |
| ASTR200 | Laboratory Safety | 1 | - |
| Phys 251 | Methods of theor. Phys 1 | 4 | Math 202 |
| Phys 252 | Classical mechanics 1 | 3 | Phys 102,Math 202 |
| Astr\*\* | Astronomy elective course | 4 |  |
|  |  |  |  |
|  | Total units | 16 |

**Level 07 (17 units) Level 08 (17 units)**



|  |  |  |  |
| --- | --- | --- | --- |
| **Course No** | **Course Title** | **Unit****s** | **Pre- requisite** |
| Astr 422 | Space Physics | 3 | Astr 331 |
| ISLS 301 | Islamic Studies 3 | 2 | ISLS 201 |
| Phys 331 | Electricity & Magnetism 1 | 3 | Phys 202-Phys 251 |
| Arab 201 | Arabic Language 2 | 3 | Arab101 |
| xxxxx | Free elective | 3 |  |
| xxxxx | Free elective | 3 |  |
|  | Total units | 17 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No** | **Course Title** | **Units** | **Pre- requisite** |
| Phys.352 | Methods of theor. Phys 2 | 4 | Phys 251 |
| ISLS401 | Islamic Studies 4 | 2 | ISLS 301 |
| Astr 390 | Summer Training | 2 |  |
| Phys xxxx | Physics Elective | 7 | - |
| Phys xxxx | Physics Elective |
| Astr xxxx | Astronomy Elective | 2 | - |
|  | Total units | 17 |

## Plan of Studies in Mathematics /Astronomy

**First Year for Science Students**

Level 01 (12 units) Level 02(15 units)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course No** | Course Title | Units | **Pre- requisite** |  | **Course No** | Course Title | Units | **Pre- requisite** |
| Math 110 | Calculus | 3 | - |  | STAT 110 | Statistics 1 | 3 | - |
| Phys 110 | General Physics | 3 | - | CHIM 110 | General Chemistry | 3 | - |
| Elc 101\* | English Language 1\* | 3 | - | Elc 102 | English Language 2\* | 3 | Els 101 |
| Cs 100\*\* | Computer \*\* | 3 | - | Comm. 101\* | Communications & skills\* | 3 | - |
|  |  |  |  | Baio 110 | General Baiology | 3 | - |
|  | Total units | 12 |  |  | Total units | 15 |

**\*condensed course no less than 15 units weekly \*condensed course no less than 15 units weekly**

**\*\* Or Communication & skills Comm101 \*\* Or Computer Cs101**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course No** | **Course Title** | **Units** | **Pre- requisite** |  | **Course No** | **Course Title** | **Units** | **Pre- requisite** |
| Math 202 | Calculus 2 | 4 | Math 110 |  | Astr 211 | Telescope &accessories | 3 | Astr 201+phys 110 |
| Arab 101 | Arabic Language1 | 3 |  | Math 204 | Ordinary Differential Eqa. 1 | 3 | Math 202 |
| Phys 102 | General physics 2 | 4 | Phys 110 | Astr 202 | General Astronomy 2 | 4 | Astr 201 |
| Astr 201 | General Astr 1 | 4 | - | Math203 | Calculus 3 | 4 | Math 202 |
| Isls 101 | Islamic Studies 1 | 2 | - | Bio 281 | Baiology Lab. | 1 | - |
| Astr200 | Laboratory saffety | 1 | - | PHYS 281 | Physics Lab. | 1 | - |
|  | Total units | 18 |  |  | Total units | 16 |  |

**Level 03 (18 units) Level 04 (16 units)**

**Level 05 (18 units) Level 06 (15 units)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No** | **Course Title** | **Units** | **Pre- requisite** |
| Astr 351 | Stellar Radiate. Char. | 3 | Astr202,Phys 202 |
| Astr 331 | Spherical Astronomy 1 | 3 | Astr202,Math202 |
| Astr 304 | Computer Applications in astronomy | 3 | Astr202,Phys202 |
| Astr 371 | Physics of Solar System | 2 | Astr 202 |
| Math 241 | Linear lgebra | 3 | Math 110 |
| Isls 102 | Islamic Studies 2 | 2 | Isls 101 |
| Astr 321 | Variable & Binary Stars | 2 | Astr 351 |
|  | Total units | 18 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No** | **Course Title** | **Unit s** | **Pre- requisite** |
| Isls 103 | Islamic Studies 3 | 2 | Isls 102 |
| Astr 391 | Scientific terminology | 2 | - |
| Astr 341 | Celestial Mechanics 1 | 3 | Astr 331 |
| Math 251 | Fundamental of mathematics | 3 | - |
| Math 261 | Analytic Geometry | 3 | Math 110 |
| Stat 101 | Astro. Electiv Course | 2 | - |
|  |  |  |  |
|  | Total units | 15 |

**Level 07 (17 units) Level 08 (17 units)**



|  |  |  |  |
| --- | --- | --- | --- |
| **Course No** | **Course Title** | **Unit****s** | **Pre- requisite** |
| Math 311 | Real Analysis 1 | 3 | Math202 |
| Astr 432 | Spherical Astronomy 2 | 3 | Astr 331 |
| ISLS 301 | Islamic Studies 3 | 2 | ISLS 201 |
| xxxxx | Free elective | 3 |  |
| xxxxx | Free elective | 3 |  |
| Arab 201 | Arabic Language 2 | 3 | Arab101 |
|  |  |  |  |
|  | Total units | 17 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Course No** | **Course Title** | **Units** | **Pre- requisite** |
| Math xxx | Mathematic Elective | 9 | - |
| Math xxx | Mathematic Elective | - |
| Math xxx | Mathematic Elective |
| Astr xxxx | Astronomy Elective | 6 | - |
| Astr xxxx | Astronomy Elective |
| Astr xxxx | Astronomy Elective |
| Astr390 | Summer Training | 2 |  |
|  | Total units | 17 |

# Description of Astronomy Department Courses

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 201 | General Astronomy (1) | 3 | 3 | 4 | - |

#### Objectives of the course:

The aim of this course is to give a general introduction about the space science and all celestial objects in the sky as well as the way to detect their coordinates according to the daily and yearly motions of the Earth around the Sun*.*

#### Course Description:

This course contains the following subjects: Historical background. The different branches of astronomy and their applications and uses. The celestial sphere and apparent motions. Celestial coordinates. Measurements of time and calendars. An introduction to the study of the Planets and Kepler's law. Solar and lunar eclipses. Tides. Some physical properties about the Earth, the Sun, and stars*.*

#### Main text and subsidiary books:

**2004**

* New Solar System, Beaty and Chaikin 1990, 2nd edition *.*
* Fundamental Astronomy, H. Karttumen, P. Kroger; 1996. Springer*.*
* Contemporary Astronomy, Jay M. Pasachoff, Saunders College Publishing 1985*.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 202 | General Astronomy (2) | 3 | 3 | 4 | Astr 201 |

The aim of this course is to give some astronomical knowledge about celestial objects and physical and dynamical properties of the stars*.*

#### Course Description:

This course contains the following subjects: The main characteristics of stars (distance, brightness, magnitude, surface temperature, color index, radius, mass, size, chemical composition) Spectral type. Stellar velocity (proper motion, radial motion, space velocity). H.R. diagram. The Stellar systems (single, double, Variables, clusters). Galaxies, Pulsations Quasars, and Black Hors*.*

#### Main text and subsidiary books:

* OTO lectures on Astrophysics, D. Page, J. G. Hirsch: Springer 2000*.*
* Structure of the Universe A.E. Roy & D. Clarke, 1992*.*
* The Dynamical Universe Snow, West Pub. Company, 1988*.*
* Contemporary Astronomy, Jay M. Pasachoff, Saunders College Publishing 1985

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **3** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 203 | History of Astronomy | 3 | - | 3 |  |

#### Objectives of the course:

The aim of this course is to give a knowledge to the students about the history of the Astronomy and the contributions of the Arab and Muslime scientists in the development of the humanity knwolge in that field.

#### Course Description:

The general idea about the celestial objects movements – The Astronomy in the Pharaonic era - The Chinese Astronomy - The Pabelion Astronomy - The Greek Astronomy - The Arab Astronomy – The Contrebutions of the Islamic civilization on the field of Astronomy.

#### Main text and subsidiary books:

* OTO lectures on Astrophysics, D. Page, J. G. Hirsch: Springer 2000*.*
* Structure of the Universe A.E. Roy & D. Clarke, 1992*.*
* The Dynamical Universe Snow, West Pub. Company, 1988*.*
* Contemporary Astronomy, Jay M. Pasachoff, Saunders College Publishing 1985

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **4** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 211 | Telescopes and Accessories | 2 | 3 | 3 | Astr 201, Phys 101 |

The aim of this course is to give an idea about the different types of astronomical tools (Properties, Components, and Uses)*.*

#### Course Description:

This course contains the following subjects: studies of the optical telescopes ( types, components, properties). Radio telescopes. Orbital telescopes. Solar telescopes, Infrared telescopes, Methods of construction of telescopes for various astronomical purposes. Types of astronomical detectors (Spectrographs, Photographic plates and their properties, photoelectric photometers, CCD Camera)*.*

#### Main text and subsidiary books:

* Reflectin, Telescope Optics I : (2000), R*.*N. Wilson - Springer*.*
* Astrophysical Techniques by : C.R. Kitchin, Adam Hilger, (1984)*.*
* CCD Astronomy by Christian Buil (1993)*.*
* Astronomical Photometry by Arne A. Henden Ronald H. Kaitchuck*.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **5** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 304 | The celestial Navigation | 2 | 3 | 3 |  |

#### Objectives of the course:

The aim of this course is to give an idea about how to use the astronomical observation in the field of marine navigation.

#### Course Description:

The celestial sphere, Apparent movement of heavenly bodies, Horizon coordinate system (Altitude and Azimuth), Equatorial coordinate system (Declination and hour angle), Greenwich and Sidereal time, The Navigation Triangle, Circumpolar stars, The Time Diagram, Twilight – nautical – civil. Nautical Almanac - Increments and d & v Corrections. Marine Sextant, Altitude corrections. Position by stars - Altitude Intercept - Hilaire method.

#### Main text and subsidiary books:

* Admiralty Manual of Navigation, Vol. 2, HMSO, London, 1978.
* The Principles and Practice of Navigation. By: A. Frost, Master M.R.I.N.

2001.

* The Complete on-Board Celestial Navigator Everything but the Sextant. Geroge

G. Bennett.2007.

* Textbook on Spherical Astronomy, Sixth Edition Revised by R.M. Green, 1977.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **6** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 304 | Computer Application in Astronomy | 2 | 3 | 3 | Astr 202,Phys 202 |

#### Objectives of the course:

The aim of this course is to help the students to make programs for some astronomical aspects.

#### Course Description:

This course contains the following subjects: An introduction to the basic principles of programming using the BASIC language. Applications to astronomy (Sunrise, Sunset, Twilight calculations, determining the starting of months at different calendars, search and determination of periodicity. Finding the paths of the planets, commits, and artificial satellites. Determination of Makkah. Determination of the effect of the atmospheric refraction on celestial objects coordinates energy curves of stars, other application)*.*

#### Main text and subsidiary books:

* Practical Astronomy with your calculator, Peter Duffett-Smith, Cambridge University Press, 1991*.*
* Astronomy with your Personal Computer, Peter Duffett-Smith, Cambridge

University Press, 1986*.*

* Astronomy on the Personal Computer: 2000. 4th. edition. T. Pfleger.

Springer, Germany*.*

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| **7** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 321 | Variable & binary Stars | 2 | - | 2 | Astr 351 |

#### Objectives of the course:

The aim of this course is to study the physical properties and space distribution of variable stars and the properties of Binary stars and its importance in the astronomical studies*.*

#### 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*.*

#### Main text and subsidiary books:

* Eclipsing Binary Stars, J. Kallarathand, E.F. Milonc, 1999*.*
* Strohmeier, W. "Variable Stars" 1972.

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| **8** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 331 | Spherical Astronomy (1) | 2 | 3 | 3 | Astr 202, Math 202 |

#### Objectives of the course:

The aim of this course is to give the students bases for determining the positions of the celestial bodies relative to fundamental planes*.*

#### 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*.*

#### Main text and subsidiary books:

* A Guide to the celestial sphere: 1996, James, B. Kaler. Amazon, USA*.*
* Astronomy on the personal computer: 2000. 4th edition. T. Pfleger. Springer, Germany*.*
* Spherical Astronomy : R. Green, Cambridge University Press, 1985*.*
* Computational Spherical Astronomy: L.G. Taff, John Wiley and Sons, 1981.

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| **9** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 341 | Celestial Mechanics (1) | 3 | - | 3 | Astr 331 |

#### Objectives of the course:

The aim of this course is to study the laws of motion for celestial bodies natural or artificial, and to study the effects of the different perturbations on them*.*

#### Course Description:

This course contains the following subjects : Analytical study of Kepler's and Newton's laws. The potential of the gravitational field. Earth's rotation. Rectilinear motion near the Earth's surface. Central motion. The two body problem. Space orbital elements and their computations. Expansions of elliptic motion. Oblate ness perturbation on the motion of the artifical satellites. Drag effect on the motion of artificial satellites., Dynamics of stellar systems*.*

#### Main text and subsidiary books:

* Orbital and celestial mechanics: 1998, John, P. Vinti. Edited by Gim, J. Der. Nino, L *.* Bonavito. AIAA Education Series, USA*.*
* An Introduction to Mathematics and Method of Astrodynamics: 1999,

Battin. AIAA Education Series, USA*.*

* Satellite Orbits: 2000, O. Montenbruck. Springer, Germany *.*

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| **10** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 351 | Stellar Radiation Characteristics | 2 | 3 | 3 | Astr 202, Phys 202 |

#### Objectives of the course:

The aim of this course is to study the stellar radiation in different spectral regions and the way to detect this radiation in order to study the physics and evolution of stars *.*

#### Course Description:

This course contains the following subjects : The electromagnetic radiation. Stellar radiation in different spectral regions. Estimating the stellar temperature. The color index and color excess. Effects of interstellar medium absorption and air masses on stellar spectra. Photographic and photoelectric observations. Photometric systems and their applications. Measurements and evaluation of the stellar radiation and its applications. Introduction to the Polarimetric studies, and its applications*.*

#### Main text and subsidiary books:

* Steller Physics, Bisnovatyi-Kogan, 2001, Springer*.*
* The dynamic univers, 1988, T.P. Snow *.*

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| **11** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 352 | Stellar Atmospheres | 2 | - | 2 | Astr 351 |

#### Objectives of the course:

The aim of this course is to study the stellar atmospheres by solving some models based on the solution of the equation of radiation transfer through different physical properties media *.*

#### Course Description:

This course contains the following subjects: Atomic structure, Deep study of the physical properties of the radiation field. Interaction of radiation with matter. Emission and absorption. The statistical equilibrium equation. The equation of radiation transfer and its solution for continuous radiation. The stellar Gray atmosphere. Line transfer equation in stellar atmosphere - Curve of growth. Chemical abundances in stellar atmosphere*.*

#### Main text and subsidiary books:

* Stellar Atmospheres : theory and Observations, Greve, 1997, Springer*.*
* Stellar Physics (II), Bisonovatyi-Kogan, 2001, Springer*.*
* Radiation Transfer and Stellar Atmospheres : T.L. Swihart Pachart Publishing House, 1981.
* Introduction to Stellar Atmospheres and Interiors : Eva Novotny, Oxford University press, 1973*.*

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| **12** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 361 | Radio Astronomy | 2 | - | 2 | Astr 211, 351 |

#### Objectives of the course:

The aim of this course is to give the students general knowledge about radio astronomy*.*

#### Course Description:

This course contains the following subjects: Principles of radio astronomy, instrumentation. The origin of radio waves (thermal and non-thermal radiation - Plasma Vibration and radiation of accelerated charges. Liner radio spectra. Radio emission generated from the Sun, galaxy, and extra galaxies. Detection of some astronomical measurements by radio instruments*.*

#### Main text and subsidiary books:

* Tools of Radio Astronomy Rohlts, 2000, Springer*.*
* Radio Astronomy by: J. D. Kraus, Cygnus-Quasar Book, 1986.
* Tools of Radio Astronomy Problems and Solutions, Wilson, 2000, Springer*.*

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| **13** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 371 | Physics of the Solar System | 2 | - | 2 | Astr 202 |

#### Objectives of the course:

The aim of this course is to concentrate the student knowledge on the solar system by studying the physics of the planets and their structure, atmospheres, and components *.*

#### Course Description:

This course contains the following subjects : Origin and evolution of the solar system. The Planets and their satellites (motions, masses, densities , atmospheres, compositions). The planetary medium. The effects of the solar phenomenon and, he Solar winds on Earth (Van Allen belts, Aurora, Geomagnetic disturbances, Zodiacal light).

#### Main text and subsidiary books:

* New Solar System, Beaty and Chaikin , 1990, 2nd eddition*.*
* Dynamic Universe, Snow, 1987*.*
* Physics of Planetary Rings, A.M. Fridman, N.N. Gorkavyi. Springer (1999)*.*
* Contemporary Astronomy, Pasachoff, 1984*.*

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| **14** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 390 | Training (1) | 1 | - | 2 | Department approve |

#### Objectives of the course:

The aim of this course is to train the student on the astronomical Studies taken

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| **15** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 391 | Scientific terminology | 2 | - | 2 | - |

#### Objectives of the course:

The aim of this course is to teaching special scientific topics for different astronomical topics.

#### Course Description:

Taking a list of scientific terminology in Arabic and English of different astronomical topics and knowing how to research to find them from their resources.

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| **16** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 422 | Space Physics | 2 | 3 | 3 | Astr 331 |

#### Objectives of the course:

The aim of this course is to give general knowledge about the sources of the charged particles in the space and its interaction with the magnetic and electric fields in space.

#### Course Description:

The course contains the following subjects: The sources of the charged particle in the space - The sources of the magnetic and electric fields in space - The interaction between the charged particle and the electric and the magnetic fields in space – Solar wind – Earth’s magnetosphere and ionosphere - Geomagnetic phenomena and aurora.

#### Main text and subsidiary books:

* Introduction to space physics: 1995, Atmo Kivelson, Margaret, G. Kivelson (Editor) , Christopher, T. Russel (Editor). Amazon, USA*.*
* Basic space plasma physics: 1996. W. Baumjohann, Amazon, USA*.*
* Space Physics: 1998. M.B. Kallenrode. Springer, Germany*.*

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| **17** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 432 | Spherical Astronomy (2) | 2 | 3 | 3 | Astr 331 |

#### Objectives of the course:

The aim of this course is for an advanced study on the applications of the spherical trigonometry for positional astronomy *.*

#### 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*.*

#### Main text and subsidiary books:

* A Guide to the celestial sphere: 1996, James, B. Kaler. Amazon, USA*.*
* Astronomy on the personal computer: 2000. 4th edition. T. Pfleger.

Springer *,* Germany*.*

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| **18** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 442 | Celestial Mechanics (2) | 3 | - | 3 | Astr 341 |

#### Objectives of the course:

The aim of this course is to give the students an advanced study of some problems concerning the motion of celestial bodies and the methods of their solutions*.*

#### Course Description:

This course contains the following subjects : The three-body problem. Restricted problem of the three bodies. The surface of zero relative velocity. Perturbation theory. Lagrange's equations of planetary motions and their applications on the lunar motion. The two-body problem and the motion of artificial satellites. Hamilton canonical equations and their applications on the two-body problem. The solution of Hamilton - Jacoby equations for the two- body problem. Regular equations for artificial satellites mechanics. The effect of radiation pressure on the motion of artificial satellites. Prediction of artificial satellites on the Earth's gravitational field with axial symmetry*.*

#### Main text and subsidiary books:

* Orbital and celestial mechanics: 1998, John, P. Vinti. Edited by Gim, J. Der.

Nono. L *.* Bonavito. AIAA Education Series, USA*.*

* An introduction to mathematics and method of Astrodynamics: 1999, Battin.

AIAA Education Series, USA*.*

* Satellite orbits: 2000, O. Montenbruck. Springer, Germany*.*

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| **19** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 453 | Stellar Interior | 2 | - | 2 | Astr 352 |

#### Objectives of the course:

The aim of this course is to study the solution of stellar interior equations, knowing the analytical or numerical formation to the physical properties in stellar interior, and studies of the chemical abundances through the stellar evolution*.*

#### Course Description:

This course contains the following subjects: Thermal hydrodynamic equilibrium in stellar interior. Instigated theories for solution of the elementary stellar interior equations. Determination of pressure, temperature, and density. Numerical solution for different stellar interior models. Nuclear reactions and energy generation in stellar interior. Different stages of stellar evolution*.*

#### Main text and subsidiary books:

* Steller interiors, Hanson, Kawaler, 1994, Springer*.*
* Stellar structure and Evolution, Kippenhahn, 1994. Springer*.*
* The Physics of Stars : S.A. Kaplan-John Wiley and Sons, 1981 *.*

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| **20** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 472 | Solar Physics | 1 | 3 | 2 | Astr 371,352 |

#### Objectives of the course:

The aim of this course is to study the physics of the Sun and its atmosphere*.*

#### Course Description:

This course contains the following subjects : Determination of the solar constant. Solar spectra. Solar formation (interior - atmosphere). The photosphere. Solar atmosphere motion. Solar magnetic field. Sunspots. Solar cycles. Flares. Prominences. Corona and chromo sphere. Corpuscular radiation and its effects on the geomagnetic field. Solar radio emission *.*

#### Main text and subsidiary books:

* The Sun from space, Lang, 2000, Springer*.*
* The Solar Atmosphere: Durrant 1988*.*
* Physics of Solar Flare: Hanssen and Emslei 1990*.*
* The Sun: A lab. for Astrophysics: Brown and Schmelz 1992*.*

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| **21** | **Course No.** | **Course Title** | **No. of Units** | **Pre-requisites** |
| **Th.** | **Pr.** | **Credit** |
|  | Astr 481 | Galaxies | 2 | - | 2 | Stat101,Astr 351 |

#### Objectives of the course:

The aim of this course is to study the galaxies and their distribution*.*

#### Course Description:

This course contains the following subjects : Morphological classification of galaxies and their cosmic distribution. Surface luminosity distribution. Distances and magnitudes of galaxies. Photometric characteristics of galactic light in different spectral regions. Apparent distribution of galaxies relative to direction. The relation between time and distances to galaxies. Masses of galaxies. Star counts in galaxies. Disc galaxies*.*

#### Main text and subsidiary books:

* Galaxtic Astronomy, Michal Merrified & James Binney *,* 1998*.*
* Tayler R.J. 1978, " Galaxies : Structure and evolution*"* Galaxy formation, Longair, 1998, Springer*.*