# Course Information

## COURSE INFORMATION

| Course Title | Code | Semester | L+U Hour | Credits | ECTS |
|---|---|---|---|---|---|
| Energy Production In Stars | FZ5059 | | 3 + 0 | 3.0 | 7.5 |

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|---|---|
| **Prerequisites** | None |
| **Language of Instruction** | Turkish |
| **Course Level** | Second Cycle |
| **Course Type** | Elective |
| **Mode of delivery** | Face to face |
| **Course Coordinator** | Assoc. Prof. Dr. Esin SOYDUGAN |
| **Instructors** | Prof. Dr. Ahmet ERDEM<br>Prof. Dr. Caner ÇİÇEK<br>Assoc. Prof. Dr. Faruk SOYDUGAN<br>Assoc. Prof. Dr. Esin SOYDUGAN<br>Assist. Prof. Dr. Gülnur GÜN |
| **Assistants** | |
| **Course Objectives** | Understanding energy transfer process in stars. |
| **Course Content** | Some basic characteristic of stars, star clusters and population groups, transport of energy, energy transfer with conduction and radiation, transport of energy with convection, energy in adiabatic process and convective instability, internal structure equation in radiative and convective zones, opacity in stars, determination of opacity and opacity source (electron scattering, H- and opacity..), energy sources in stars and time scales, nuclear energy and reactions, P-P and CNO cycle, three alpha reactions, reactions for more heavy elements, Creation of heavy elements more than Si. and e,r,s,p functions, Interaction of photon with matter |
| **Course Learning Outcomes** | 1) Recognize energy transfer process in stars.<br>2) Write internal structure equation in radiative and convective zones.<br>3) Recognize P-P and CNO cycle. |

## WEEKLY COURSE CONTENT

| Week | Topics | Teaching and Learning Methods and Techniques | Study Materials |
|---|---|---|---|
| 1. Week | Some basic characteristic of stars. Star Clusters and population groups. | Oral lectures, applications and homeworks. | |
| 2. Week | Transport of Energy. Energy transfer with conduction and radiation. | Oral lectures, homework, practice. | |

Quick Access

Physics (Master)
- Qualification Awarded
- Level of Qualification
- Qualification Requirements and Regulations
- Specific Admission Requirements
- Recognition of Prior Learning
- Profile of the Program
- Program Key Learning Outcomes
- Occupational Profile of Graduates
- Access to Further Studies
- Course Structure & Credits
- Exam Regulations & Assessment & Grading
- Graduation Requirements
- Mode of Study
- Programme Director(or Equivalent)
- Evaluation Questionnaire
- TYYÇ

Course Information
- Course Information
- Weekly Course Content
- Resources
- Course Category
- CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES
- ECTS credits and course workload

| | | | |
|---|---|---|---|
| 3. Week | Transport of Energy with convection. Energy in adiabatic process and convective instability. | Oral lectures, homework, practice. | |
| 4. Week | Internal structure equation in radiative and convective zones-I. | Oral lectures, homework, practice. | |
| 5. Week | Internal structure equation in radiative and convective zones-II. | Oral lectures, homework, practice. | |
| 6. Week | Opacity in stars. | Oral lectures, homework, practice. | |
| 7. Week | Determination of opacity and opacity source (electron scattering, H- and opacity..). | Oral lectures, homework, practice. | |
| 8. Week | Mid-term exam. | Written exam. | |
| 9. Week | Energy sources in stars and time scales. | Oral lectures, homework, practice. | |
| 10. Week | Nuclear energy and reactions. | Oral lectures, homework, practice. | |
| 11. Week | P-P and CNO cycle-I. | Oral lectures, homework, practice. | |
| 12. Week | P-P and CNO cycle-II. | Oral lectures, homework, practice. | |
| 13. Week | Three alpha reactions. Reactions for more heavy elements. | Oral lectures, homework, practice. | |
| 14. Week | Creation of heavy elements more than Si. and e,r,s,p functions. | Oral lectures, homework, practice. | |
| 15. Week | Interaction of photon with matter. | Oral lectures, homework, practice. | |
| 16. Week | Final exam. | Written axam. | |

## RESOURCES

| Recommended Sources |
|---|
| -“An introduction to the theory of Stellar Structure and Evolution”, D. Prialnik, 2000, Cambridge University Press. -“Physics formation and Evolution of Rotating Stars”, A. Maeder, 2009, Springer-Verlag Berlin Heidelberg. |
| -Erika, B-V.: 1989, Introduction to Stellar Astrophysics Vol:1, 2 and 3 , Cambridge University Press. |
| -“Structure and Evolution of Single and Binary Stars”, C.W.H. Deloore and C. Doom, 1992, Kluwer Academic Publishers. |

## ASSESSMENT

| Measurement and Evaluation Methods and Techniques |
|---|
| Mid-term exam (40 percent), Final exam (60 percent). |

## COURSE CATEGORY

| Course Category | Percentage |
|---|---|
| Core Courses | % 100 |

## CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES

| Programme Outcomes | Contribution Level | DK1 | DK2 | DK3 |
|---|---|---|---|---|
| PY1 | 5 | 5 | 4 | 5 |
| PY2 | 3 | 4 | 3 | 3 |
| PY3 | 5 | 5 | 4 | 5 |
| PY4 | 5 | 5 | 5 | 5 |
| PY5 | 5 | 5 | 4 | 5 |
| PY6 | 5 | 5 | 4 | 5 |
| PY7 | 5 | 5 | 5 | 4 |
| PY8 | 5 | 4 | 5 | 5 |
| PY9 | 4 | 4 | 3 | 4 |
| PY10 | 3 | 3 | 3 | 3 |
| PY11 | 3 | 3 | 3 | 3 |
| PY12 | 5 | 5 | 4 | 5 |
| PY13 | 4 | 4 | 3 | 4 |
| PY14 | 4 | 4 | 4 | 3 |
| PY15 | 5 | 5 | 4 | 5 |

*DK = Course's Contrubution.

| | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **Level of contribution** | None | Very Low | Low | Fair | High | Very High |

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## ECTS CREDITS AND COURSE WORKLOAD

| Event | Quantity | Duration (Hour) | Total Workload (Hour) |
|---|---|---|---|
| Final Exam | 1 | 3 | 3 |
| Final Exam Preparation | 1 | 43 | 43 |
| Mid Term Exam 1 | 1 | 3 | 3 |
| Class Hours (14 weeks) | 14 | 3 | 42 |
| Further Study | 14 | 2 | 28 |
| Mid Term Exam Preparation | 1 | 45 | 45 |
| Preliminary Study | 14 | 2 | 28 |
| | | **Total Workload** | 192 |
| | | **Total Workload / 25.5 (s)** | 7.53 |
| | | **ECTS Credit of the Course** | 8 |