# Course Information

## COURSE INFORMATION

| Course Title | Code | Semester | L+U Hour | Credits | ECTS |
|---|---|---|---|---|---|
| Quantum Field Theory II | FZ-6012 | | 3 + 0 | 3.0 | 7.5 |

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|---|---|
| **Prerequisites** | None |
| **Language of Instruction** | Turkish |
| **Course Level** | Third Cycle |
| **Course Type** | Elective |
| **Mode of delivery** | Face to face |
| **Course Coordinator** | Assist. Prof. Dr. Sezgin AYGÜN |
| **Instructors** | Prof. Dr. İhsan YILMAZ<br>Prof. Dr. İsmail TARHAN<br>Assist. Prof. Dr. Melis ULU DOĞRU<br>Assist. Prof. Dr. Sezgin AYGÜN |
| **Assistants** | |
| **Course Objectives** | To learn the relation of quantum and fields with various applications. |
| **Course Content** | Renormalization of the stress-energy tensor methods of renormalization Calculation of renormalized stress-energy tensor Calculation of renormalized stress-energy tensor point-splitting method zeta function methods examples from renormalization techniques examples from renormalization techniques examples from renormalization techniques two dimensional examples Robertson-Walker model Robertson-Walker model examples in four dimensions examples in four dimensions |
| **Course Learning Outcomes** | 1) to obtain knowledge about renormalization of the stress-energy tensor:,will be able to learn methods of renormalization<br>2) to learn the calculation of the renormalized stress-energy tensor,will be able to learn point-splitting method.<br>3) to learn zeta function method,will be able to knowledge , Kruskal extension, Interior solutions, Formation of black holes, Black hole temperature and entropy<br>4) to obtain knowledge examples from renormalization techniques, two dimensional examples, Robertson-Walker model, examples in four dimensions. |

## WEEKLY COURSE CONTENT

| Week | Topics | Teaching and Learning Methods and Techniques | Study Materials |
|---|---|---|---|
| 1. Week | Stres tensor, renormalization | Oral lectures Homeworks, discussions | |
| 2. Week | methods of renormalization | Oral lectures | |

Quick Access

Physics (PhD)
- 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

| | | | |
|---|---|---|---|
| | | Homeworks, discussions | |
| 3. Week | Calculation of renormalized stress-energy tensor | Oral lectures Homeworks, discussions | |
| 4. Week | Calculation of renormalized stress-energy tensor | Oral lectures Homeworks, discussions | |
| 5. Week | point-splitting method | Oral lectures Homeworks, discussions | |
| 6. Week | zeta function methods | Oral lectures Homeworks, discussions | |
| 7. Week | examples from renormalization techniques | Oral lectures Homeworks, discussions | |
| 8. Week | renormalization techniques and examples | Oral lectures Homeworks, discussions | |
| 9. Week | Renormalizasyon techniques and examples | Oral lectures Homeworks, discussions | |
| 10. Week | two dimensional examples | Oral lectures Homeworks, discussions | |
| 11. Week | Robertson-Walker model | Oral lectures Homeworks, discussions | |
| 12. Week | Robertson-Walker model | Oral lectures Homeworks, discussions | |
| 13. Week | examples in four dimensions | Oral lectures Homeworks, discussions | |
| 14. Week | examples in four dimensions | Oral lectures Homeworks, discussions | |
| 15. Week | General review | Oral lectures Homework, discussions | |
| 16. Week | General review | Oral lectures , Applications | |

## RESOURCES

| Recommended Sources |
|---|
| Birrell N.D., P.C.W. Davies,1982, Quantum fields in curved space, Cambridge University Press, |
| Franz Mandl, Graham Shaw, 2010, Quantum Field Theory, John Wiley & Sons |
| Eberhard Zeidler, 2011, Quantum Field Theory III: Gauge Theory: A Bridge Between Mathematicians and Physicists, Springer |

## ASSESSMENT

| Measurement and Evaluation Methods and Techniques |
|---|
| Mid-term exam, final exam, other |

## COURSE CATEGORY

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

## CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES

| Programme Outcomes | Contribution Level | DK1 | DK2 | DK3 | DK4 |
|---|---|---|---|---|---|
| PY1 | 5 | 5 | 5 | 5 | 5 |
| PY2 | 5 | 5 | 5 | 5 | 5 |
| PY3 | 5 | 5 | 5 | 5 | 5 |
| PY4 | 5 | 5 | 5 | 5 | 5 |
| PY5 | 5 | 5 | 5 | 5 | 5 |
| PY6 | 5 | 5 | 5 | 5 | 5 |
| PY7 | 5 | 5 | 5 | 5 | 5 |
| PY8 | 5 | 5 | 5 | 5 | 5 |
| PY9 | 5 | 5 | 5 | 5 | 5 |
| PY10 | 5 | 5 | 5 | 5 | 5 |
| PY11 | 5 | 5 | 5 | 5 | 5 |
| PY12 | 5 | 5 | 5 | 5 | 5 |
| PY13 | 5 | 5 | 5 | 5 | 5 |
| PY14 | 5 | 5 | 5 | 5 | 5 |
| PY15 | 5 | 5 | 5 | 5 | 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) |
|---|---|---|---|
| Class Hours (14 weeks) | 14 | 3 | 42 |
| Final Exam Preparation | 1 | 20 | 20 |
| Preliminary Study | 14 | 2 | 28 |
| Assignment 1 | 16 | 3 | 48 |
| Presentation/Seminar | 6 | 2 | 12 |
| Mid Term Exam Preparation | 1 | 20 | 20 |
| Further Study | 6 | 2 | 12 |
| Assignment 2 | 3 | 2 | 6 |
| Mid Term Exam 1 | 1 | 2 | 2 |
| Final Exam | 1 | 2 | 2 |
| **Total Workload** | | | 192 |
| **Total Workload / 25.5 (s)** | | | 7.53 |
| **ECTS Credit of the Course** | | | 8 |