Course Information

COURSE INFORMATION

Course Title	Code	Semester	L+U Hour	Credits	ECTS
Grand Unification Theory	FZ5016		3 + 0	3.0	7.5

Prerequisites	None
Language of Instruction	Turkish
Course Level	Second Cycle
Course Type	Elective
Mode of delivery	Face to face
Course Coordinator	Assist. Prof. Dr. Melis ULU DOĞRU
Instructors	Prof. Dr. İhsan YILMAZ Prof. Dr. İsmail TARHAN Assist. Prof. Dr. Melis ULU DOĞRU Assist. Prof. Dr. Sezgin AYGÜN
Assistants	
Course Objectives	The aim of course is to define the knowledge about formation and evolution of the universe, and determine the age of the universe, and define inflation era, formation of galaxies, symmetries, cosmic particles and cosmological models, detailed.
Course Content	Newton Gravitation Theory, Friedmann equations, the meaning of expansion, expansion equations, equations of general relativity, Newton Cosmological models, Hubble's Law, Expansion and redshift, Olber's paradox, Astronomical distances and age of universe, Space-time metric, the principle of covariance and the principle of equivalence, Einstein Gravitation Theories, General Relativity, test of relativity theories, The geometry of universe, flat-spherical and hyperbolical universe, cosmological models according to k values, Observational parameters, Hubble Parameter, density parameter, deceleration parameter and cosmological constant, Cosmological models I: Schwarzschild solutions and Black holes, Cosmological models II: Friedmann cosmologies and de Sitter cosmologies, Thermodynamics of universe, photons, adiabatic expansion, electroweak interactions, early radiation era, time of decoupling, Big bang theory, Cosmic microwave background radiation, anisotropies of background radiation, nucleosynthesis, baryosynthesis, space-time problem, dynamical dark matter, Cosmological expansion, horizon problem, flatness problem, solutions of big bang problems , The structure of universe, observational structure and gravitational instability, Dark matter-dark energy.
Course Learning Outcomes	1) gain a professional perspective about the formation and evolution of the universe 2) use a professional perspective about the formation and evolution of the universe understand the evolution and physical state of the universe, and have the knowledge to follow the original and recent papers about the universe

WEEKLY COURSE CONTENT

Week	Topics	Teaching and Learning Methods	Study Materials

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

		and Techniques	
1. Week	Newton Gravitation Theory, Friedmann equations, the meaning of expansion, expansion equations, equations of general relativity	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
2. Week	Newton Cosmological models, Hubble's Law, Expansion and redshift	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
3. Week	Olber's paradox, Astronomical distances and age of universe	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
4. Week	Space-time metric, the principle of covariance and the principle of equivalence	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
5. Week	Einstein Gravitation Theories, General Relativity, test of relativity theories	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
6. Week	The geometry of universe, flat-spherical and hyperbolical universe, cosmological models according to k values	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
7. Week	Observational parameters, Hubble Parameter, density parameter	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
8. Week	Cosmological models I: Schwarzschild solutions and Black holes,	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
9. Week	Cosmological models II: Friedmann cosmologies and de Sitter cosmologies	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
10. Week	Thermodynamics of universe, photons, adiabatic expansion, electroweak interactions, early radiation era, time of decoupling	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
11. Week	Thermodynamics of universe, photons, adiabatic expansion, electroweak interactions, early radiation era, time of decoupling	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
12. Week	Cosmological expansion, horizon problem, flatness problem, solutions of big bang problems	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
13. Week	The structure of universe, observational structure and gravitational instability	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
14. Week	Dark matter-dark energy	Oral lectures with interactive	

		discussions, Homeworks, Applications, Pratic	
15. Week	general review	Oral lectures with interactive discussions, Homeworks, Applications, Pratic	
16. Week	final exam	exam	

RESOURCES

Recommended Sources
Introduction to cosmology, M.Roos, Wiley, Chichester, 1997.
Gravitation and Cosmology, S. Weinberg, Wiley, Chichester, 1972.
An Introduction to Modern Cosmology, Ansrew Liddle, Wiley, Chichester, 1998.

ASSESSMENT

Measurement and Evaluation Methods and Techniques
Quiz, Homework, Midterm exam, Final

COURSE CATEGORY

Course Category	Percentage
Core Courses	% 100

CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES

Programme Outcomes	Contribution Level	DK1	DK2
PY1	3	3	3
PY2	4	4	4
PY3	5	5	5
PY4	3	3	3
PY5	3	3	3
PY6	3	3	3
PY7	5	5	5
PY8	0	0	0
PY9	4	4	4
PY10	0	0	0
PY11	0	0	0
PY12	0	0	0
PY13	0	0	0
PY14	0	0	0
PY15	0	0	0

*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
Presentation/Seminar	4	3	12
Final Exam Preparation	1	25	25
Mid Term Exam Preparation	1	25	25
Research&Project	7	5	35
Assignment 1	16	3	48
Final Exam	1	3	3
Mid Term Exam 1	1	3	3
Total Workload			193
Total Workload / 25.5 (s)			7.57
ECTS Credit of the Course			8