

COURSE/MODULE DESCRIPTION(SYLLABUS)

1.	Course/module Effective Quantum Field Theory	
2.	University department Faculty of Physics and Astronomy	
3.	Course/module code 24-FZ-S2-E2-WspecEq	
4.	Course/module type – mandatory (compulsory) or elective (optional) Optional	
5.	University subject (programme/major) Physics	
6.	Degree: (<i>master, bachelor</i>) Master	
7.	Year 1 and 2	
8.	Semester (<i>autumn, spring</i>) Spring	
9.	Form of tuition and number of hours Lectures 30 hours, exercises 30 hours	
10.	Name, Surname, academic title Chihiro Sasaki, Dr.	
11.	Initial requirements (knowledge, skills, social competences) regarding the course/module and its completion * Quantum Mechanics * Electrodynamics * Special Relativity	
12.	Objectives * Effective approach to strongly interacting systems * Concept of effective field theory (EFT) * Loops and renormalization in EFT * Application to Quantum Chromodynamics (QCD)	
13.	Learning outcomes * Knowledge of the modern concept of EFT as a reliable approximation of strong-coupling gauge theories, the limitation of EFT and other approach * Knowledge of Hadron Physics as low-energy QCD * Techniques to compute various observables at tree and loop level * Recent developments and future perspectives of QCD and other gauge theories	Outcome symbols: <i>K2_W01, K2_W02, K2_W03, K2_W06, K2_U03, K2_K01</i>

14.	Content																												
	<ul style="list-style-type: none"> * Symmetries and conserved currents * Spontaneous symmetry breaking and Nambu-Goldstone bosons * Gauge symmetry and Higgs mechanism * Chiral symmetry breaking and low-energy theorems * Axial anomaly * Chiral perturbation theory for pions (and heavier hadrons) 																												
15.	Recommended literature																												
	<ul style="list-style-type: none"> * Peskin, Schroeder: An introduction to quantum field theory * Cheng, Li: Gauge theory of elementary particle physics * Weinberg: Physica A 96, 327 (1979) * Gasser, Leutwyler: Annals Phys.158, 142 (1984), Nucl.Phys.B250, 465 (1985) 																												
16.	Ways of earning credits for the completion of a course /particular component, methods of assessing academic progress:																												
	lecture: examinations class: laboratory: seminar: other:																												
17.	Language of instruction																												
	English																												
18.	Student's workload																												
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Activity</th> <th style="text-align: center;">Average number of hours for the activity</th> </tr> </thead> <tbody> <tr> <td>Hours of instruction (as stipulated in study programme) :</td> <td style="text-align: center;">30</td> </tr> <tr> <td>- lecture:</td> <td style="text-align: center;">30</td> </tr> <tr> <td>- classes:</td> <td style="text-align: center;">-</td> </tr> <tr> <td>- laboratory:</td> <td style="text-align: center;">-</td> </tr> <tr> <td>- other:</td> <td style="text-align: center;">-</td> </tr> <tr> <td>student's own work, e.g.:</td> <td style="text-align: center;">45</td> </tr> <tr> <td>- preparation before class (lecture, etc.)</td> <td style="text-align: center;">-</td> </tr> <tr> <td>- research outcomes:</td> <td style="text-align: center;">15</td> </tr> <tr> <td>- reading set literature:</td> <td style="text-align: center;">-</td> </tr> <tr> <td>- writing course report:</td> <td style="text-align: center;">30</td> </tr> <tr> <td>- preparing for exam:</td> <td style="text-align: center;">-</td> </tr> <tr> <td>Hours</td> <td style="text-align: center;">150</td> </tr> <tr> <td>Number of ECTS</td> <td style="text-align: center;">6</td> </tr> </tbody> </table>	Activity	Average number of hours for the activity	Hours of instruction (as stipulated in study programme) :	30	- lecture:	30	- classes:	-	- laboratory:	-	- other:	-	student's own work, e.g.:	45	- preparation before class (lecture, etc.)	-	- research outcomes:	15	- reading set literature:	-	- writing course report:	30	- preparing for exam:	-	Hours	150	Number of ECTS	6
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*Key to symbols:

K (before underscore)- learning outcomes for the programme

W- knowledge

U- skills

K (after underscore) - social competences

01, 02, 03 and subsequent- consecutive number of learning outcome