International Polytechnic SUMMER & WINTER SCHOOLS

POLYTECH Peter the Great St.Petersburg Polytechnic University

Advances in Nuclear Fusion Science

Version **Effective from (date of when the course was developed)**	2022/1 15 June 2022

ECTS Credits	2
Level/Year	
Teaching (contact) hours	18
Total learner managed hours (incl. self-work)	54
Total hours of student learning	72

Pre-requisites	Knowledge of Calculus and General Physics corresponding to a Master's degree program in science, technology, engineering, mathematics. Knowledge of fundamentals of plasma physics and basic nuclear fusion science. Good command of English. All classes and extracurricular activities are conducted in English.
Co-requisites	None
Alignment to graduate profiles	This course contributes to achievement of the graduate outcomes of the following qualifications: • Master of Physics • Graduate Diploma in Physics • Diploma in Physics • Ph.D. in Physics
Course aim	The purpose of the course is to provide the students with the possibility to learn directly from the authors of contemporary scientific publications contributing to the development of the physics basis of the controlled nuclear fusion.
Indicative Course content	Synergy of Fusion and Fission - prospective development option. Distributions of nuclear fusion products in plasma Fast ion diagnostics in tokamaks Current drive by microwaves Heavy ion beam probing - a tool to study electric fields and turbulence in fusion plasmas Advanced application of Doppler backscattering to study plasma oscillatory processes Quasineutrality. Ambipolar Diffusion. Review of lithium technologies in fusion programme. Disruption mitigation in tokamak reactors.

LEARNING OUTCOMES

On successful completion of this course students will be able to:	
1	Describe contemporary research activities on fusion-fission hybrid systems
2	Understand energy spectra of nuclear fusion products, reactor power and neutron yield
3	Describe the mechanisms of current generation by microwaves
4	Understand principles of advanced plasma diagnostics such as fast particles, HIBP and DBS
5	Navigate the physics basis of lithium technologies and disruption mitigation in tokamaks

ASSESSMENTS

Basis of assessment	

Methods of assessment	Learning Outcomes	Pass criteria (Minimum)	% Weightings
Summative review	1, 2, 3	40%	60%
Portfolio – summative of practices	4, 5	40%	40%

REQUIREMENTS FOR SUCCESSFUL COURSE COMPLETION

Requirements	Mark of 40% or more in every summative assessment

RESULTS

Assessment results	Results for assessments are given in percentage marks
Course results	• Individual assessments may cover one or more of the learning outcomes. • Each summative assessment is assigned a percentage weighting. • The overall percentage mark for the course is calculated by adding the weighted results for all summative assessments.

LEARNING AND TEACHING

Learning and teaching approaches	Lectures and group discussions, learner managed activities.
Learning and teaching resources	Textbooks, journals and library resources; use of Internet; computer software.
Learner managed activities	• Completion of course work • Reading of course materials • Study group work • Preparation for classes • Practicing relevant skills/methods/techniques • Self-evaluation of course work • Gathering relevant contextual information/ issues/ideas to build knowledge of the subject