Lecture Title	**Introduction to Synchrotron Radiation : Experiments and Research**
Speaker	Dr. Esen Ercan Alp Argonne Distinguished Fellow, Senior Scientist Advanced Photon Source, X-Ray Science Division Argonne National Laboratory, Argonne, Illinois 60439, USA
Abstract	Synchrotron radiation enabled photon-based sciences to solve electronic, atomic, molecular and macroscopic structure of matter in the last 80 years. In this period, we have seen implementation of 1^{st}-to-4^{th} generation electron storage rings and development of x-ray free electron lasers, thus enhancing the brightness, coherence and energy range beyond one can dream. Parallel to the developments on the machine side, similar progress occurred in x-ray optics, detectors, and new ways of accomplishing structural and spectroscopic methods was accomplished. We are now entering in a new era of machine learning and articial intelligence where new kind of experiments becomes feasible. In this lecture, we will stay close to basic principles and explain how technological breakthoughs enhanced our ability to explain the natural world that surrounds us using photons.
Learning Objectives	1) Basic features of storage rings as photon sources 2) Atomic principles of x-ray science 3) Common elements of x-ray optics 4) Scattering, absoprtion, diffraction, spectroscopy and imaging sciences 5) Perspectives for SESAME
Keywords	X-ray science, x-ray optics, diffraction, absorption, fluorescence, spectroscopy, imaging
Target audience	Begginer synchrotron users, graduate students, early carreer researchers
Language	English
Contents	1. Overview of synchrotron radiation sources 2. Comparison of bending magnet, wiggler and undulator sources 3. Principles of x-ray science at the atomic level 4. Diffractive, reflective and refractive optics 5. Basic spectroscopic methods 6. Selected scientific appliactions
Prerequisites	Basic knowledge of x-ray science
References	**An Introduction to Synchrotron Radiation: Techniques and Applications** **Author: Philip Willmott, First published:1 March 2019** **Print ISBN:9781119280392 |Online ISBN:9781119280453** **DOI:10.1002/9781119280453, © 2019 John Wiley & Sons Ltd.**

3D image processing software

name	URL	features	open source	license type
ImageJ	https://fiji.sc/	Image analysis for everyone	yes	
Dragonfly	https://www.theobjects.com/dragonfly/index.html		no	Academic; single user
BONEJ	https://bonej.org/	ImageJ plugin	yes	
Paraview	https://www.paraview.org/		yes	
3D Slicer	https://www.slicer.org/		yes	
napari	https://napari.org	Interactive Python viewer for multi-dimensional images	yes	
simpleITK	https://github.com/InsightSoftwareConsortium/SimpleITK-Notebooks	Python package for advanced 3D image processing	yes	
Silx	https://www.silx.org/	Explore RAW synchrotron experiment data	yes	