TIA GRADUATE SCHOOL SUMMER OPEN FESTIVAL 2021

Summer Lecture in 2021 for Nanoscience/Nanotechnology
Recruitment of Participants

Degree Programs in Pure and Applied Sciences, University of Tsukuba and Institute for NanoScience Design, Osaka University will jointly hold the Summer Lecture in 2021 for Nanoscience/Nanotechnology as part of the development of human resources. Lectures will be conducted with the combination of on-demand and on-live styles, since last year the movement restrictions caused by the COVID-19 prevent us to invite foreign lecturers abroad to Tsukuba. The Summer School 2021 is composed of four topics of lectures, three out of that (They will be held on Session A:Advanced Nanotechnology Ⅰ～Ⅲ) are chosen from our archives recorded in 2018 and 2019.
The recorded lectures of seven or eight times will be uploaded on the INSD website during July 20th to August 16th (The details are as follows) . During these each period, participating students should finish to view a series of lectures on-demand style and each time soon after viewing each lecture, send their answer to short questions for the evidence of viewing.

The lecture documents will be uploaded on URL: http://www.insd.osaka-u.ac.jp/nano/
and URL: https://tia-edu.jp/summerlec2021/
The final test will be given as on-live style of student presentation with the participation of the lecturers abroad.
The ZOOM system or Cisco Webex Meeting will be used for the final presentation.

On the other hand, one out of four topics of lectures (It will be held on Session B: Advanced Nanotechnology Ⅳ) is scheduled after September to be held onsite.

We are looking forward to your participation.

Session A

Dates ■Guidance (on-live)

Advanced Nanotechnology Ⅰ: July 27th Tue. 2021 AM10:00～11:00
Advanced Nanotechnology Ⅱ: July 27th Tue. 2021 PM4:00～5:00
Advanced Nanotechnology Ⅲ: July 20th Tue. 2021 PM4:00～4:30

■ Viewing Period of the recorded lectures (on-demand):

Advanced Nanotechnology Ⅰ・Ⅱ: July 27th to August 16th , 2021 (21 days)
Advanced Nanotechnology Ⅲ: July 20th to July 31th , 2021 (12 days)

■ The final test and Office Hour Period(on-live):

Advanced Nanotechnology Ⅰ:【Office Hour (Q&A)】August 10th Tue. AM10:00～11:00
【The final test 】August 19th Thu. &20th Fri. 2021 AM10:00～11:30
Advanced Nanotechnology Ⅱ: August 26th Thu. 2021 PM4:00～5:30
Advanced Nanotechnology Ⅲ:【Office Hour (Q&A)】July 28th Wed. 2021 PM4:00～ /
【The final test 】August 6th PM4:00～7:00

Venues With the combination of on-demand and on-live styles.

Lecturers
- Prof. Masashi Watanabe "Transmission Electron Microscopy-Fundamental Principle and Applications to Materials Science" (Dept. of Mater. Sci. & Eng., Lehigh University, USA).
- Prof. Marie D'angelo "Introduction to Photoelectron Spectroscopy and Synchrotron Radiation" (Institute for Nanosciences of Paris, Sorbonne University, France)
- Prof. Etienne Gheeraert and Prof. Henri Mariette "Semiconductor Physics and Engineering, Doping, Defect, Optical Properties, (University Grenoble-Alpes and University of Tsukuba)

Lecture Schedule (about 90 minutes per lecture)

Lecturers	Guidance (live)	During July 27 - August 16 (on demand recorded lectures) After viewing each lecture, reply to short questions given in each lecture								Final Test and Office Hour (live)
Prof. Masashi Watanabe	July 27 10 - 11am	1	2	3	4	5	6	7	*	August 19 & 20 10 - 11:30 am
Prof, Marie D'angelo	July 27 4 - 5pm	1	2	3	4	5	6	7		August 26 4 - 5:30 pm

* Office Hour (live) August 10 10 - 11 am To be asked to attend

Lecturers	Guidance (live)	During July 20 - July 31(on demand recorded lectures) After viewing each lecture, reply to short questions given in each lecture *								*Office Hour and Final Test (live)
Prof. Etienne Gheeraert & Prof. Henri Mariette	July 20 4 – 4:30pm	1	2	3	4	5	6	7	8	July 28 4 pm-/ August 6 4-7pm

Note: After the application deadline

Advanced Nanotechnology Ⅰ・Ⅱ: July 25th Sun. 2021

Advanced Nanotechnology Ⅲ: July 15th Thu. 2021

,a participation confirmation will be sent to all participants by e-mail (～the day after the application deadline).

Session B

Dates Adjusting in September, October or November with on-site Lectures.

Venues Laboratory of Advanced Research B, the University of Tsukuba.

Lecturers Assoc. Prof. Jacob Overgaard "X-ray diffraction-derived charge density methods in materials science" (Aarhus University, Denmark).

Targeted Participants Graduate students and professionals interested in Nanotechnology and Nanoscience

Note: With a recommendation letter from your academic adviser, college seniors and students of technical colleges can attend this course.

Number of Positions Around 30 people (View all lectures in principle)

Selection Process Registration form screening (In case of oversubscription, we will give priority to graduate students)

Tuition Fee Free

How to Apply

Please write the following in an email and send it to the e-mail address below.

①Full name②Affiliation③Grade④Your academic adviser

E-mail: tia-edu@un.tsukuba.ac.jp.

Application Deadline:

Advanced Nanotechnology Ⅰ・Ⅱ: July 25th Sun. 2021

Advanced Nanotechnology Ⅲ: July 15th Thu. 2021

Advanced Nanotechnology Ⅳ: To be announced

Approval of Credits

Graduate Students of University of Tsukuba

The students who received e-mail notice of participation confirmation and would like to acquire the credits, register class subjects in TWINS by your major field. The credits will be included as completion of requirements of *Graduate program. *For later period of graduate program (Docotor's course), only the students of Nanoscience/Nanotechnology major, can acquire the credits.

	Majors or degree programs / Classes & Lecturers	Degree programs	Majors			
			Nano-science and Nano-technology	Applied Physics	Materials Science	Physics
Session A 7/19～8/26	Advanced Nanotechnology Ⅰ **Prof. Masashi Watanabe**	0AJJA33	02BQ207	01BF291	01BG089	01BC306
	Advanced Nanotechnology Ⅱ **Prof. Marie D'angelo**	0AJJA34	02BQ210	01BF292	01BG090	01BC307
	Advanced Nanotechnology Ⅲ **Prof. Etienne Gheeraert and Prof. Henri Mariette**	0AJJA35	02BQ208	01BF293	01BG091	01BC308
Session B After September	Advanced Nanotechnology Ⅳ **Assoc. Prof. Jacob Overgaard**	0AJJA36	02BQ209	01BF294	01BG092	01BC309

Schedule from Registration to the last day

*in the following, Advanced Nanotechnology Ⅰ－Ⅲ will be referred to as Ⅰ－Ⅲ, respectively.

Session A	Items
Ⅰ・Ⅱ：July 25th Sun./ Ⅲ：July 15th Thu.	Application deadline
～the day after the application deadline.	An e-mail notice of participation confirmation will be sent from applicants.
Ⅰ・Ⅱ：July 27th Tue./ Ⅲ：July 16th Fri.	ＴＷＩＮＳ Input due date (Only for students of University of Tsukuba)
Ⅰ：July 27th Tue. AM10:00～11：00 Ⅱ：July 27th Tue. PM4:00～5:00 Ⅲ：July 20th Tue. PM4:00～4:30	Guidance (on-live)
Ⅰ・Ⅱ：During July 27th Tue. -August 16th Mon. / Ⅲ：July 20th. Tue. -July 31th Sat.	Viewing Period of the recorded lectures (on-demand) *after viewing each lecture, send their answer to short questions for the evidence of viewing.
Ⅰ:【Office Hour (Q&A)】 August 10th Tue. AM10:00～11:00, 【The final test 】 August 19th &20th AM10:00～11：30 Ⅱ：August 26th PM4:00～5:30 Ⅲ：【Office Hour （Q＆A）】 July 28th Wed. PM4:00～/ 【The final test】 August 6th PM4:00～7:00	The final test Period and Office Hour (on-live) (The final test will be given as on-live style of student presentation) *We will inform each student of the test schedule and how to access ZOOM or Webex etc. at a later date.

Session B	Items
To be announced	

Contact Information

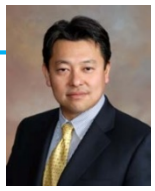
University of Tsukuba, Tsukuba Innovation Arena Promotion Office
tia-edu@un.tsukuba.ac.jp　Tel. 029-853-4028
http://tia-edu.jp

■Abstract

※ about 90 minutes per lecture

Session A

Transmission Electron Microscopy - Fundamental Principle and Applications to Materials Science



Prof Masashi Watanabe
(Dept. of Mater. Sci. & Eng., Lehigh University, USA)

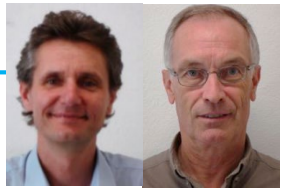
- Basic concepts of TEM instrumentation
- Electron scattering and diffraction
- Image formation in TEM
- Analysis in TEM
- Advanced topics and applications of TEM

Introduction to Photoelectron Spectroscopy and Synchrotron Radiation

Prof. Marie D'angelo
(Institute for NanoSciences of Paris, Sorbonne University, France)

-Generalities & technical aspects of photoemission
-Interaction Hamiltonian & transition probability
-Transitions from localized states: core level photoemission
-Band dispersion: Angle-Resolved Photoemission
-X-ray production: comparison of X-ray tubes, synchrotron radiation and Free Electron Laser
-Basics and theory of synchrotron radiation
-New developments in photoemission: time-resolved and near ambient pressure photoemission

Semiconductor Physics and Engineering, Doping, Defect, Optical Properties



Prof. Etienne Gheeraert and Prof. Henri Mariette
(Université Grenoble Aples and University of Tsukuba)

- Introduction to the various semiconductor materials and general concepts
- Semiconductor doping by diffusion
- Semiconductor doping by ion implantation
- Basic phenomena in semiconductor optics
- Elementary electronic devices

Session B

X-ray diffraction-derived charge density methods in materials science

Assoc. Prof. Jacob Overgaard
(Aarhus University, Denmark)

X-rays were discovered more than 125 years ago by Wilhelm Conrad Röntgenin Germany,
and this mysterious radiation was quickly taken into scientific use for elucidating the atomic structure of simple materials by Max von Laue. In these summer lectures, I will go through the basic theory of X-ray diffraction from crystalline materials, which involves concepts such as space group symmetry, scattering theory, the structure factor, and crystal structure refinement using the independent atom model.
Building on this understanding of X-ray diffraction that we will reach, I will introduce a more advanced model, the so-called multipole model, which describes the total electron density, including the bonding electrons, preferred d-orbital populations and lone pairs. We will learn how this model enables us to extract both atomic and molecular properties such as atomic charges, molecular dipole moments, d-orbital populations, bond and lattice energies, and many other fascinating properties. If there is time, I will also introduce Hirshfeld atom refinement and the related X-ray constrained wavefunction refinement approach.
In the final part of the lectures, we will learn how to use these new models to extract important information relevant in single molecule magnetism.