

SCoMOA Course Syllabus

The course covers following topics:

Session & Time	Topic	Learning Outcome	Lecturer
1 09:00-10:40 Fri, 28 Jul 23	Fundamentals of Optics <ul style="list-style-type: none"> • Physics of light: Wave-particle duality, wave vector, Poynting vector, wavelength, velocity, refractive index, attenuation, light absorption & emission, ray, wavefront, polarization: TE, TM, elliptical • Geometrical optics • Wave optics • Introduction to Photonics 	Participants are able to describe physics of light and its applications to photonics/modern optics	Dr. Agoes Soehanie (Institut Teknologi Bandung, Indonesia)
2a 10:40-11:30 Fri, 28 Jul 23	Theory of Optical Waveguides: <ul style="list-style-type: none"> • Concepts of waveguiding • TIR • Transverse resonance conditions • guided, radiation, and leaky modes • TE and TM polarization in slab waveguides • dispersion curves • single mode cut-off • V-number • number of modes • weakly guiding waveguides • mode profiles • labeling of modes 	Participants are able to describe optical waveguiding mechanism, able to solve dispersion equations and simulate guided mode profiles of symmetric and asymmetric slab waveguides	Dr. Muldarisnur (Univ. Andalas, Indonesia)

	<ul style="list-style-type: none"> • symmetric and asymmetric slab waveguides. 		
2b 13:30-14:20 Fri, 28 Jul 23	<p>Lab works on Optical Mode Solving:</p> <ul style="list-style-type: none"> • Introduction to mode solving techniques • classification of mode solvers • freewares for mode solving • solve for modes of several assigned problems (slab and channel waveguides) using free online tools 	Participants are able to describe types of mode solver, able to solve modes of simple waveguides using online tools	Dr. Henri P. Uranus (Universitas Pelita Harapan, Indonesia)
3 14:20 – 16:00 Fri, 28 Jul 23	<p>Characterization of Optical Waveguides:</p> <ul style="list-style-type: none"> • Refractive index measurements • Waveguide Loss measurements 	Participants are able to describe several techniques for measuring the refractive index and loss of waveguide using the prism coupler technique	Prof. Ayi Bahtiar (Universitas Padjadjaran, Indonesia)
4 08:00-09:40 Sat, 29 Jul 23	<p>Optical Fibers:</p> <ul style="list-style-type: none"> • Construction of optical fiber • Types of optical fiber • Light guiding in optical fiber • Types of rays • Sizes of optical fiber • Transmission windows in silica optical fiber • Parameters of optical fibers: NA, attenuation, dispersion, mode field diameter, cut off wavelength • Modes of optical fiber • Vectorial modes: Hybrid modes 	Participants are able to describe the types of optical fibers, its working principles, parameters, its modes, and types and principles of specialty fibers	Dr. Henri P. Uranus (Universitas Pelita Harapan, Indonesia)

	<ul style="list-style-type: none"> • Scalar modes: the LP modes • Specialty fibers: nano wires, PCF, POF, polarization sensitive fibers, photo sensitive fibers, dispersion shifted/flattened fibers 		
5 09:40-11:20 Sat, 29 Jul 23	Plasmonics & Biomedical Applications: <ul style="list-style-type: none"> • Electromagnetism of metal and fundamental theory • Surface Plasmon Resonance • Synthesis and Functionalized Gold Nanoparticles (AuNPs) • Biomedical Application of AuNPs: <ul style="list-style-type: none"> - Drug delivery - As cancer diagnostics and therapeutics agents - As biosensor - Detection of biological molecules and microorganism. 	Participants are able to describe principles of plasmonics and its applications in biomedical fields.	Dr. Priastuti Wulandari (ITB, Indonesia)
6a 13:00-14:25 Sat, 29 Jul 23	Solar Cells <ul style="list-style-type: none"> • Semiconductor Band Structure Characteristics • Working Principle of Silicon Solar Cells • Basic Solar Cells Characterizations • Nanocrystalline based Solar Cells • Third Generation and New Emerging Solar Cells 	Participants are able to describe working principles of solar cells, and characterization methods of solar cells	Dr. Rahmat Hidayat (ITB, Indonesia)

	<ul style="list-style-type: none"> • Other types of Solar Energy Conversions 		
6b 14:25-14:40 Sat, 29 Jul 23	Light for Sustainable Developments	Participants are able to discuss the importance of light for sustainable developments	Dr. Rahmat Hidayat (ITB, Indonesia)
7 14:50-17:50 Sat, 29 Jul 23	Lab works Experiments	Participants are able to describe set-ups and methods used in the experiment	Dr. Herman (ITB, Indonesia) Dr. Sahrul Hidayat (Univ. Padjadjaran, Indonesia) Norman Syakir, M.Sc. Set-ups from: <ul style="list-style-type: none"> • ITB • Univ. Padjadjaran • Serviam Abadimurni
8 & 9 4 x 50 mins Sun, 30 Jul 23	Group Work Paper writing	Participants are able to perform literature study on topics in photonics and collaboratively write a document out of the study following a proper scientific standard	
10 08:00-09:40 Mon, 31 Jul 23	Optical Periodic System and Photonic Crystals	Participants are able to describe the physics of optical periodic system and photonic crystals through its bandstructure and able to describe some applications of these optical systems	Prof. Dr. Alexander A. Iskandar (ITB, Indonesia)
11 09:40-11:20 Mon, 31 Jul 23	Laser-Induced Breakdown Spectroscopy: <ul style="list-style-type: none"> • Basic principle • LIBS Experimental Setup • Characteristics of LIBS plasma • LIBS applications 	Participants are able to describe the basic principle of laser-induced breakdown spectroscopy (LIBS), LIBS experimental setup, characteristics of LIBS plasma, and LIBS applications.	Prof. Dr. Aslam Baig (National Centre for Physics, Pakistan)
12 13:00-14:40 Mon, 31 Jul 23	Fiber Lasers	Participants are able to describe principles of fiber laser and related techniques.	Prof. Dr. Sulaiman W. Harun (Univ. Malaya, Malaysia)

13 14:50-16:30 Mon, 31 Jul 23	Evaluation • Quiz • Paper Submission	Participants are able to internalized the whole topics	All lecturers
14 08:30-10:10 Tue, 1 Aug 23	Laser and Interaction with Materials (ISMOA23 Tutorial)	Participants are able to describe principles and techniques used in laser-material interactions	Dr. Isnaeni (BRIN, Indonesia)
15 10:30-12:10 Tue, 1 Aug 23	Integrated Photonics: from Material Science to Quantum Computing (ISMOA23 Tutorial)	Participants are able to describe principles and techniques used in integrated nanophotonics	Prof. Dr. David Marpaung (Univ. Twente, The Netherlands)
16a 13:00-13:50 Tue, 1 Aug 23	Basic of Surface Plasmon Resonance (ISMOA23 Tutorial)	Participants are able to describe principles and techniques used in surface plasmon resonance	Dr. Yuto Kajino (Kyushu Univ., Japan)
16b 13:50-14:40 Tue, 1 Aug 23	Fundamentals and Applications of Plasmonic Metasurfaces (ISMOA23 Tutorial)	Participants are able to describe applications of plasmonic metasurfaces	Prof. Dr. Kaoru Tamada (Kyushu Univ., Japan)