SCoMOA Course Syllabus

The course covers following topics:

Session & Time	Topic	Learning Outcome	Lecturer
Day 1			
1 09:00-09:50 WITA Fri, 25 Jul 25	**Fundamentals of Optics** • 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 Soehianie (Institut Teknologi Bandung, Indonesia)
2 09:50-11:30 WITA Fri, 25 Jul 25	**Theory of Optical Waveguides** • 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)

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	• symmetric and asymmetric slab waveguides. • Channel waveguides		
3 13:30-14:20 WITA Fri, 25 Jul 25	**Lab works on Optical Mode Solving** • 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	Prof. Henri P. Uranus (Universitas Pelita Harapan, Indonesia)
4 14:20–15:10 WITA Fri, 25 Jul 25	**Optical Fibers** • 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 • Scalar modes: the LP modes • Specialty fibers: nano wires, PCF,	Participants are able to describe the types of optical fibers, its working principles, parameters, its modes, and types and principles of specialty fibers	Prof. Henri P. Uranus (Universitas Pelita Harapan, Indonesia)

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	POF, polarization sensitive fibers, photo sensitive fibers, dispersion shifted/flattened fibers		
5 15:10-16:00 WITA Fri, 25 Jul 25	**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. Alexander A. Iskandar (Institut Teknologi Bandung, Indonesia)
6 16:00-17:40 WITA Fri, 25 Jul 25	**Plasmonics** • Electromagnetism of metal and fundamental theory • Surface Plasmon Resonance • Synthesis and Functionalized Gold Nanoparticles (AuNPs) • Biomedical Application of AuNPs: - 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 (Institut Teknologi Bandung, Indonesia)
Day 2			
7 08:00-08:50 WITA Sat, 26 Jul 25	**Solar Cells** • Semiconductor Band Structure Characteristics • Working Principle of Silicon Solar Cells • Basic Solar Cells Characterizations • Nanocrystalline based Solar Cells	Participants are able to describe working principles of solar cells, and characterization methods of solar cells	Prof. Rahmat Hidayat (Institut Teknologi Bandung, Indonesia)

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	• Third Generation and New Emerging Solar Cells • Other types of Solar Energy Conversions		
8 08:50-09:40 WITA Sat, 26 Jul 25	**Laser-Induced Breakdown Spectroscopy** • 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.	Dr. Ali Khumaeni (Univ. Diponegoro, Indonesia)
9 09:40-11:20 WITA Sat, 26 Jul 25	**Fiber Sensors** • Principles of fiber sensor • Types of fiber sensors • Application examples of fiber sensors	Participants are able to describe principles of fiber sensors and its applications.	Prof. Agus M. Hatta (Institut Teknologi Sepuluh Nopember, Indonesia)
10 13:00-14:40 WITA Sat, 26 Jul 25	**Fiber Lasers**	Participants are able to describe principles of fiber laser and related techniques.	Prof. Sulaiman W. Harun (Univ. Malaya, Malaysia)
11 14:40-16:20 WITA Sat, 26 Jul 25	**FEM Modelling in Photonics** • Principles of FEM • Applications of FEM for modelling various photonic structures	Participants are able to describe principles of FEM modelling and various cases of modelling photonic structures using FEM.	Prof. B. M. A. Rahman (City St. George's, University of London, UK)
12 16:20-18:00 WITA Sat, 26 Jul 25	**Labworks Experiments**	Participants are able to describe set-ups and methods used in the experiment	Prof. Hery Suyanto (Univ. Udayana, Indonesia)
Day 3			
13 6 x 50 mins Sun, 27 Jul 25	**Groupwork & Paper writing**	Participants are able to perform literature study on topics in photonics and collaboratively write a document out of the study	

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		following a proper scientific writing standard	
Day 4			
14 08:30-10:10 WITA Mon, 28 Jul 25	**Integrated Photonics** (ISMOA25 Tutorial)	Participants are able to describe principles and techniques used in integrated photonics	Prof. David Marpaung (Univ. Twente, The Netherlands)
15 10:30-12:10 WITA Mon, 28 Jul 25	**Metasurfaces** (ISMOA25 Tutorial)	Participants are able to describe principles of photonic metasurfaces	Prof. Olivier J. F. Martin (École Polytechnique Fédérale de Lausanne, Switzerland)
16 13:00-14:40 WITA Mon, 28 Jul 25	**Quantum Optics** (ISMOA25 Tutorial)	Participants are able to describe principles and techniques used in quantum optics	Prof. Takashi Kuroda (National Institute for Material Sciences, Japan)
17 2 x 50 mins Mon, 28 Jul 25	**Evaluation** • Online Exam • Group Paper Submission	Participants are able to internalized the whole topics	All lecturers

Total Learning Load: 16 x 100 mins