UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
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Master in Mathematics

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MODULE HANDBOOK
Master in Mathematics

Module name:	**Biomathematics (*Bio-Matematika*)**
Module level, if applicable:	**Master Program**
Code, if applicable:	**MMM 5313**
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught:	1st semester
Person responsible for the module:	Chair of the Applied Mathematics Research Group
Lecturer(s):	Lina Aryati
Language:	Bahasa Indonesia
Relation to curriculum:	Master Degree in Mathematics, Elective, 1st semester
Teaching methods	
Workload (incl. contact hours, self-study hours)	• **3x50 minutes lectures,** • **3x60 minutes structured activities,** • **3x60 minutes individual study,** • **In 16 weeks per semester (including mid-term and final examinations).** • The total workload is 136 hours per semester.
Credit points	3
Required and recommended prerequisites for joining the module:	**Before taking this course, it is better if students have good experiences inMathematical Modeling in Differential Equations.**
Module objectives/intended learning outcomes:	After completing this course, the students should be able to • CO 1. create models of more complex epidemic problems. • CO 2. solve epidemic problems by investigating the stability of equilibrium points.
Content:	Introduction: the simplest SIR model. Review: Stability of Equilibrium Points and Linearization method. Direct Methods: Lyapunov Function, La Salle Theorem. First Integral. Basic Reproduction Number. Global Stability. More general SIR model. The SIS and SEIR model. Global stability of reaction-diffusion and its application to epidemic problems.
Examinations forms	
Study and examination requirements	To pass the course, the minimum grade is C. The final mark will be weighted as follows: No Assessment methods (components, activities) Weight (percentage) 1 Final Examination 30% 2 Mid-Term Examination 30% 3 Class Activities: Quiz, Homework 15% 4 Project-based 25%

Media employed:	Board, LCD Projector, Laptop/Computer
Reading List:	1. Brauer F. and Castillo-Chavez C., 2012, *Mathematical Model in Population Biology and Epidemiology,* Second Edition, Springer Science+Business Media, LLC, New York. 2. Perko L., 1991, *Differential Equations and Dynamical Systems,* Springer-Verlag, New York. 3. Vidyasagar, M., 2002, *Nonlinear Systems Analysis*, SIAM, Philadelphia. 4. Luenberger, D. G., 1979, *Introduction to Dynamic Systems: Theory, Models, & Applications,* John Wiley & Sons, New York. 5. Castillo-Chavez C., Feng Z., and Huang W., 2002, On the Computation of R_0 and Its Role on Global Stability, *Mathematical Approaches for Emerging and Reemerging Infections Diseases: Models, Methods and Theory,* Volume I, Springer-Verlag, New York. 6. Korobeinikov, A., and Maini, P. K., 2004, A Lyapunov Function and Global Properties for SIR and SEIR Epidemiological Models with Non-Linear Incidence, *Mathematical Biosciences and Engineering,* Volume I, Number1, June 2004. 7. Hattaf, K. and Yous N., 2013, Global Stability for Reaction-Diffusion Equations in Biology*, Computer and Mathematics with Applications,* 66, pp.1488-1497. 8. Wang N., Zhang L., and Teng Z., 2021, Dynamics in a reaction-diffusion epidemic model via environmental driven infection in heterogeneous space, *Journal of Biological Dynamics,* DOI 10.1080/17513758.2021.1900428 9. Other journals, adjusted as needed.

CO-PLO Mapping

	PLO – 1 S2 Mat	**PLO – 2 S2 Mat**	**PLO – 3 S2 Mat**	**PLO – 4 S2 Mat**	**PLO – 5 S2 Mat**	**PLO –6 S2 Mat**
CO 1	V			V	V	V
CO 2	V		V	V	V	V

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