UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
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Doctoral Program in Mathematics

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MODULE HANDBOOK
Doctoral in Mathematics

Module name:	Advanced Biomathematics (*Bio-Matematika Lanjut*)
Module level, if applicable:	Doctoral Program
Code, if applicable:	MMM 7307
Semester(s) in which the module is taught:	I (first year)
Person responsible for the module:	Chair of Applied Mathematics Research Group
Lecturer(s):	All eligible lecturers
Language:	Bahasa Indonesia
Relation to curriculum:	Doctoral Degree in Mathematics, Compulsory / Elective Course
Credit points:	3 Semester Credit Unit
Type of teaching, contact hours:	3x50 minutes lectures, 3x60 minutes structured activities.
Workload:	• 3x50 minutes lectures, • 3x60 minutes structured activities, • 3x60 minutes individual study, • In 16 weeks per semester (including assignments and examinations)
Recommended prerequisites:	Before taking this course, students should have been familiar with Mathematical Modeling in Differential Equations.
Module objectives/intended learning outcomes:	After completing this course the students should be able to • CO 1. Create preliminary models of problem related to the topic of dissertation. • CO 2. Overcome the preliminary models and prepare a manuscript for publication.
Content:	Introduction: SIR, SIRS, SEIR model. Stability of Equilibrium Point and Linearization method. Direct Methods: Lyapunov Function, La Salle Theorem. Fisrt Integral. Basic Reproduction Number. Global Stabillity. Additional qualitative theory and methods which are neccesary to overcome problems related to the topic dissertation. Project: Create and overcome preliminary models of problem related to the topic of disertation, a manuscript for publication.
Study and examination requirements and forms of examination:	The final mark will be weighted as follows: No Assessment methods (components, activities) Weight (percentage) 1 Manuscript for Publication 40% 2 Examination/presentation 30% 3 Other Activities: Homeworks etc. 30% Final grade will be determined as follows: Grade Criteria The initial cut-off points for grades A, B, C, and D should not be less than 80%, 65%, 50%, and 40%, respectively.

Media employed:	Board, LCD Projector, Laptop/Computer
Reading List:	1. Braurer F. and Castillo-Chavez C., 2012, *Mathematical Mode;s in Population Biology and Epidemiology,* Second Edition, Springer Science+Business Media, LLC, New York. 2. 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 Deseases: Models, Methods and Theory,* Volume I, Springer-Verlag, New York. 3. Diekmann, O., and Heesterbeek, J. A. P., 2002, *Mathematical Epidemiology of Infectious Diseases: Model Building, Analysis and Interpretation,* John Wiley & Sons, New York. 4. 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. 5. Murray J. D., 1993, *Mathematical Biology,* Springer-Verlag, Berlin. 6. Perko L., 1991, *Differential Equations and Dynamical Systems,* Springer-Verlag, New York. 7. Other text books or articles related to the topic of dissertation.

Mapping of The COs and PLOs

	PLO – 1 S3 Mat	**PLO – 2 S3 Mat**	**PLO – 3 S3 Mat**	**PLO – 4 S3 Mat**	**PLO – 5 S3 Mat**	**PLO –6 S3 Mat**
CO 1	V		V		V	V
CO 2			V		V	

Programme Learning Outcomes (PLO) Doctoral Programme in Mathematics

PLO-1	:	**Attitude:** Devote to God Almighty, uphold the humanity values, internalize academic values and ethics, responsible in working in the area of expertise independently.
PLO-2	:	**Knowledge:** Mastering philosophy of mathematics and one of the fields in mathematics (algebra, analysis, applied mathematics, statistics, computational mathematics, computational statistics).
PLO-3	:	**Knowledge:** Able to think logically, analytically, inductively, deductively, and structured; having the ability to manage, lead, and develop research programs independently, and able to communicate the thoughts as well as his work to the scientific community and the general public.
PLO-4	:	**Skill:** Creating new concepts and / or new methods (original) in the field of mathematics that are recognized nationally and internationally.
PLO-5	:	**Skill:** Able to apply mathematics according to their field of expertise to solve problems including those that require a multidisciplinary, cross-disciplinary, or trans-disciplinary approach.

PLO-6	:	***Life Long Learning:*** Having lifelong learning skills and adaptive to the development of science and technology, especially in fields related to Mathematics and its applications.