UNIVERSITAS INDONESIA
Faculty of Mathematics and Natural Sciences
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MODULE HANDBOOK

Module designation	*Numerical Stochastic Differential Equations*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Gatot F. Hertono*
Language	*Indonesian*
Relation to curriculum	*Elective*
Teaching methods	*Flipped learning and computer lab works*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 9 hours/week x 14 weeks + 5.5 hours/week x 2 weeks = 137 hours.* *Contact hours: 150 minutes lectures.* *Individual study including examination preparation, specified in hours:* *3 hours structured learning and 3 hours individual study per week.*
Credit points	*3 SKS (4.77 ECTS)*
Required and recommended prerequisites for joining the module	*Numerical Differential Equations, Mathematical Statistics 1*
Module objectives/intended learning outcomes	*After completing this course, students are expected to be able to apply Stochastic Differential Equations Methods in the fields of Science and Finance. The main topics covered include random walk and Brownian motion, stochastic differential equations (SDEs), Euler-Maruyama (EM) method and Milstein method, convergence and stability properties of EM and Milstein methods, Monte Carlo simulation, SDEs model stock prices, SDEs models in science.*

Content	1. *Random walk and Brownian motion,* 2. *Stochastic Differential Equations (SDEs),* 3. *Euler-Maruyama (EM) method,* 4. *Milstein method,* 5. *Convergence and stability properties of EM and Milstein methods,* 6. *Monte Carlo simulation,* 7. *SDEs model in stock prices,* 8. *SDEs models in science.*
Examination forms	*Essay and presentation*
Study and examination requirements	*Requirements for successfully passing the module:* *Student activity in discussion forum (10%), quiz/assignment (30%), midterm exam (30%), final exam (30%)*
Reading list	*[1] Glasserman P. 2004. Monte Carlo methods on Financial Engineering. Springer, New York.* *[2] Heath, M.T., 1997, Scientific Computing: An Introduction Survey, McGraw-Hill Co.* *[3] Higham ,D.J., 2001. An Algorithmic Introduction to Numerical Simulation of Stochastic Differential Equations, SIAM Rewiew Vol. 43, No.3, pp 525-546.* *[4] Hull, J.C. 2008. Options, Futures, & Other Derivatives, 7th Ed. Prentice Hal Int., New Jersey.* *[5] Kloeden, P.E., Platen, E. 1995. Numerical Solution of Stochastic Differential* *Equations. Springer, Berlin.* *[6] Kloeden, P.E., Platen, E., Schurs, H. 2003. Numerical Solution of SDE through Computer Experiments. Springer, Berlin.* *[7] Shreve, S.E. 2004. Stochastic Calculus for Finance II Continuous-Time Models. Springer, New York.* *[8] Wilmot, P., Quantitative Finance 3, Volume set 2nd Ed.*