

## MODULE HANDBOOK

Course:	<b>Computational Physics (Practical)</b>
Module Level:	Undergraduate
Code:	FIK306
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/Term:	6 <sup>th</sup> / Third Year
Module Coordinator(s):	Dr. Khusnul Ain, S.T. M.Si.
Lecturer(s):	Dr. Khusnul Ain, S.T., M.Si.; Endah Purwanti, S.Si., M.T. and Dr. Khusnul Ain, S.T., M.Si.
Language:	Bahasa Indonesia
Classification within the Curriculum:	Compulsory Course / <del>Elective Course</del>
Teaching format / class hours per week during semester:	2 hours of lectures (50 min / hour)
Workload:	2 hours of doing worksheet and pretest preparation, 2 hours of laboratory work, 2 hours of group discussion, searching literature and writing report, 13 weeks per semester, and total of 78 hours per semester ~ 2,6 ECTS*
Credit Points:	1
Requirement(s):	(FIT 201) Mathematical Physics I and (FIT 202) Mathematical Physics II
Learning Goals/Competences:	<p><b>General Competence (Skill):</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate knowledge to understand physical problems</li> <li>2. To analyze physics problem with numerical method approachment and program's code in computers.</li> </ol> <p><b>Specific Competence:</b></p> <ol style="list-style-type: none"> <li>1. Encode program to find the root of non linier equation with Regular False, Bisection, Newton, Secant methods</li> <li>2. Encode program to solve linear equation system with Gauss elimination, Gauss Jordan, inverse, Jacobi and Gauss-Seidel methods</li> <li>3. Encode program to solve interpolation and data fitting problems</li> <li>4. Solve ordinary differential equation by Euler, Heun, polygon, and runge-kutta methods</li> <li>5. Solve numerical of laplace and poisson equation with finite difference method</li> <li>6. Solve numerical heat transfer equation with Cranck-Nicolson method</li> <li>7. Apply fourier transform principles to solve physics problems</li> <li>8. Apply monte-carlo method in integral cases</li> </ol>

Contents:	Numerical methods, error, non linier root finding (Regular False, Bisection, Newton, Secant) linear equation system (Gauss elimination methods, Gauss Jordan, inverse, Jacobi, Gaus-Seidel) interpolation, fitting data ordinary differential equation (Euler, Heun, polygon repaired, Runge Kutta) partial differential equation (Crank-Nicolson methods, Laplace equation, Poisson equation, parabolic equation, hyperbolic equation) diffusion equation; finite difference (domain, grid point, forward, backward, central difference) Fourier transform, introduction of monte carlo methods by random generator, integral solution with monte carlo.
Soft Skill Attribute:	Effort and ethic
Study/Exam Achievements:	<p>Students are considered competent and eligible to pass the course upon obtaining at least 40 of maximum score for the exams (midterm test and final exam), structured activity(group discussion).</p> <p>Final score is calculated as follow: 20% assignment 1 + 20%assignment 2 + 30% midterm test + 30% final exam</p> <p>Final grade is defined as follow:</p> <p>A : 75 – 100  AB : 70 - 74.99  B : 65 - 69.99  BC : 60 - 64.99  C : 55 - 59.99  D : 40 - 54.99  E : 0 - 39.99</p>
Forms of Media:	Computer, Powerpoint slides, LCD projectors and whiteboards
Learning Methods:	Lecture, assessments and group discussion
Literature(s):	<ol style="list-style-type: none"> <li>1. Capra, S.C. and R.P. Canale, 2002, <i>Numerical Methods for Engineers</i>, 4th ed, Mc Graw Hill, Singapore.</li> <li>2. Cullen, C.G., 1991, <i>Linear Algebra and Differential Equation</i>, 2nd ed., Prentice Hall.</li> <li>3. DeVries, P.L., 1994, <i>A First Course in Computational Physics</i>, John Wiley &amp; Sons, New York.</li> <li>4. Gerald Curtis F. dan O. Wheatley, 1985, <i>Applied Numerical Analysis</i>, Addison-Wesley, Massachusetts</li> <li>5. Kendall E Atkinson, 1978, <i>An Introducton to Numerical Analysis</i>, Jon Wiley &amp; Sons.</li> <li>6. Yogyianto, 2005, pemrograman delphi 6, andi ofset</li> </ol>
Notes:	*Total ECTS= $\frac{\text{(total hours workload} \times 50 \text{ min)}}{60 \text{ min}} \div 25 \text{ hours}$ Each ECTS is equals with 25 hours