

# MODULE HANDBOOK

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| <b>Module Name:</b>   | Ordinary Differential Equations  |
| <b>Module Level:</b>  | Sarjana (S-1) / Bachelor   |
| <b>Abbreviation, if applicable:</b>                             | 8420203173   |
| <b>Sub-heading, if applicable:</b>                              | -  |
| <b>Course included in the module, if applicable:</b>            | -  |
| <b>Semester/term:</b>   | 3/ Second year   |
| <b>Module Coordinator(s):</b>                                   | Budi Priyo Prawoto, M.Si   |
| <b>Lecturer(s):</b>   | Dr. Abadi, M.Sc<br>Dian Savitri, M.Si<br>Rudianto Artiono, M.Si<br>Yuliani Puji Astuti, M.Si<br>Budi Priyo Prawoto, M.Si<br>Dimas Avian Maulana, M.Si  |
| <b>Language:</b>  | Indonesia  |
| <b>Classification within the curriculum:</b>                    | Compulsory course/ <del>elective studies</del>   |
| <b>Teaching format/class hours per week during the semester</b> | Teaching format: lectures, tutorial assignment, and individual study. 3 x 170 minutes = 510 minutes = 8.5 hours lectures   |
| <b>Workload:</b>  | 15 weeks per semester consisting of: <ul style="list-style-type: none"> <li>➤ 2.5 hours lectures (3 x 50 minutes) per week,</li> <li>➤ 3 hours tutorial assignments (3 x 60 minutes) per week,</li> <li>➤ 3 hours individual study (3 x 60 minutes) per week,</li> </ul> Total workload: 14x3x170 minutes = 7,140 minutes = 4.76 ECTS*       |
| <b>Credit Point:</b>  | 3  |
| <b>Requirements:</b>  | Elementary Linear Algebra<br>Integral Calculus   |
| <b>Learning Goals:</b>  | <b>Knowledge (KNO-1)</b><br>CLO-1: Classify 1 <sup>st</sup> order and 2 <sup>nd</sup> order ODEs (Ordinary Differential Equations)<br>CLO-2: Master the methods of solving 1 <sup>st</sup> order and 2 <sup>nd</sup> order ODEs<br><b>Skill (SKI-2)</b><br>CLO-3: Model nature phenomena into 1 <sup>st</sup> order and 2 <sup>nd</sup> ODEs |

|                                | CLO-4: Implement the methods to solve 1 <sup>st</sup> order and 2 <sup>nd</sup> order ODEs   |                      |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
|--------------------------------|--|----------------------|-----------------|-------------|---|------|----------------------|----|------|-------------------|----|------|-------------------|---|------|------------------|----|------|-------------------|----|------|-------------------|---|------|------------------|---|------|------------------|---|------|-----------------|
| <b>Content:</b>                | <p>First order differential equation covers linear differential equation with integrating factor, separable differential equation, homogeneous equation, exact equation, non-exact equation, Bernoulli equation, Ricatti equation, and d'Alembert equation. Second order differential equation covers homogeneous differential equation with characteristic equation, non-homogeneous differential equation with undetermined coefficient, and the method of variation of parameter. Differential equation involving piecewise defined function with Laplace transform.</p>  |                      |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| <b>Study/exam achievements</b> | <ul style="list-style-type: none"> <li>➤ Students are considered competent and pass if the final score calculated from the score of midterm exam, assignments, participation, and final exam is at least 55 or C.</li> <li>➤ Final score is calculated as follows:</li> <li>➤ 20% midterm exam + 30% assignments + 20% participation + 30% final exam</li> <li>➤ Final index is defined as follow:</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Index</th> <th>Converted Score</th> <th>Score Range</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>4.00</td> <td><math>85 \leq A \leq 100</math></td> </tr> <tr> <td>A-</td> <td>3.75</td> <td><math>80 \leq A- &lt; 85</math></td> </tr> <tr> <td>B+</td> <td>3.50</td> <td><math>75 \leq B+ &lt; 80</math></td> </tr> <tr> <td>B</td> <td>3.00</td> <td><math>70 \leq B &lt; 75</math></td> </tr> <tr> <td>B-</td> <td>2.75</td> <td><math>65 \leq B- &lt; 70</math></td> </tr> <tr> <td>C+</td> <td>2.50</td> <td><math>60 \leq C+ &lt; 65</math></td> </tr> <tr> <td>C</td> <td>2.00</td> <td><math>55 \leq C &lt; 60</math></td> </tr> <tr> <td>D</td> <td>1.00</td> <td><math>40 \leq D &lt; 55</math></td> </tr> <tr> <td>E</td> <td>0.00</td> <td><math>0 \leq E &lt; 40</math></td> </tr> </tbody> </table> | Index                | Converted Score | Score Range | A | 4.00 | $85 \leq A \leq 100$ | A- | 3.75 | $80 \leq A- < 85$ | B+ | 3.50 | $75 \leq B+ < 80$ | B | 3.00 | $70 \leq B < 75$ | B- | 2.75 | $65 \leq B- < 70$ | C+ | 2.50 | $60 \leq C+ < 65$ | C | 2.00 | $55 \leq C < 60$ | D | 1.00 | $40 \leq D < 55$ | E | 0.00 | $0 \leq E < 40$ |
| Index                          | Converted Score  | Score Range          |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| A                              | 4.00   | $85 \leq A \leq 100$ |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| A-                             | 3.75   | $80 \leq A- < 85$    |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| B+                             | 3.50   | $75 \leq B+ < 80$    |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| B                              | 3.00   | $70 \leq B < 75$     |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| B-                             | 2.75   | $65 \leq B- < 70$    |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| C+                             | 2.50   | $60 \leq C+ < 65$    |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| C                              | 2.00   | $55 \leq C < 60$     |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| D                              | 1.00   | $40 \leq D < 55$     |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| E                              | 0.00   | $0 \leq E < 40$      |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| <b>Forms of Media</b>          | Slides and LCD projectors, whiteboard  |                      |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |
| <b>Literature</b>              | <p>[1] Boyce W.E. &amp; DiPrima R.C. 2012. <i>Elementary Ordinary Differential Equations and Boundary Value Problems 10<sup>th</sup> Edition</i>, New York: John Willey and Sons.</p> <p>[2] Kreyszig, E. 2011. <i>Advanced Engineering Mathematics 10th edition</i>. New York: John Wiley and Sons.</p> <p>[3] Andrei D. Polyanin, Valentin F. Zaitsev, 2018, <i>Handbook of Ordinary Differential Equations: Exact Solution, Methods, and Problems</i>, Chapman and Hall/CRC</p>   |                      |                 |             |   |      |                      |    |      |                   |    |      |                   |   |      |                  |    |      |                   |    |      |                   |   |      |                  |   |      |                  |   |      |                 |

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|             | <p>[4] Ali Umit Keskin, 2019, Ordinary Differential Equations for Enginners: Problems with Matlab solutions, Springer International Publishing</p> <p>[5] Hartmut Logemann, Eugene P. Ryan, 2014, Ordinary Differential Equations: Analysis, Qualitative Theory and Control.: London: Springer-Verlag</p> <p>[6] Ravi P. Agarwal, Donal O'Regan, 2008, An Introduction to Ordinary Differential Equations. New York: Springer-Verlag</p> <p>[7] Prawoto, BP. 2019. Persamaan Diferensial Biasa. Surabaya: Unesa Press</p> |
| <b>Note</b> | <p>*Total hours per 1 credit in 1 semester={ (1 credit x 170 minutes x 14 weeks)/60 minutes }=39,67 hours.</p> <p>Each ECTS equals with 25 hours therefore 1 credit in 1 semester equals 1,59 ECTS.</p>   |