



# UNIVERSITAS GADJAH MADA

Faculty of Mathematics and Natural Sciences

Mathematics Department

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## Graduate Program in Mathematics

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**MODULE HANDBOOK**  
**Doctoral in Mathematics**

<b>Module name:</b>	Advance in Actuarial Mathematics (Matematika Aktuaria Lanjut)
<b>Module level, if applicable:</b>	Doctor Program
<b>Code, if applicable:</b>	MMM-5430
<b>Semester(s) in which the module is taught:</b>	First Year
<b>Person responsible for the module:</b>	Chair of The Study Program
<b>Lecturer(s):</b>	Dr. Adhitya Ronnie Effendie, M.Sc
<b>Language:</b>	Bahasa Indonesia
<b>Relation to curriculum:</b>	Doctor Degree in Mathematics, Compulsary Courses
<b>Credit points:</b>	3
<b>Type of teaching, contact hours:</b>	3x50 minutes lectures, 3x50 minutes structured activities.
<b>Workload:</b>	<ul style="list-style-type: none"> <li>• 3x50 minutes lectures,</li> <li>• 3x50 minutes structured activities,</li> <li>• 3x50 minutes individual study,</li> <li>• In 16 weeks per semester (including mid-term and final examinations).</li> <li>• Total: 144x50 minutes per semester.</li> </ul>
<b>Requirements according to the examination regulations:</b>	NONE
<b>Recommended prerequisites:</b>	Before taking this course, the students must have a good understanding in financial mathematics such as interest theory and annuities.
<b>Module objectives/intended learning outcomes:</b>	<p>On satisfying the requirements of this course, students will have the knowledge and skills to:</p> <p>CO-1: Students will comprehend basic theory of survival model and will be able to:</p> <ul style="list-style-type: none"> <li>• Explain the concepts of survival probabilities and their application in actuarial science</li> <li>• Calculate probability of time until death, life expectation, etc</li> <li>• Define some mortality laws, such as Gompertz, Makeham etc</li> </ul> <p>CO-2: Students will understand main concepts associated with life insurance and life annuities, as well as their applications</p> <ul style="list-style-type: none"> <li>• Explain the concepts of life insurance and life annuities</li> <li>• Calculate actuarial present values of several insurance contracts</li> <li>• Define the difference between continuous and discrete insurance contracts</li> </ul> <p>CO-3: Students will understand key concepts of premium calculation.</p> <ul style="list-style-type: none"> <li>• Explain the concepts of premium calculation</li> <li>• Calculate several life insurance benefit premiums</li> <li>• Define the principle of premium calculation such as equivalence or exponential premium</li> </ul>
<b>Content:</b>	<p>The purpose of this course is to develop knowledge of the fundamental actuarial tools for quantitatively assessing risk. The application of these tools to problems encountered in actuarial science is emphasized. A thorough command of the supporting calculus is assumed.</p> <ul style="list-style-type: none"> <li>• Survival Model</li> </ul>

	<ul style="list-style-type: none"> <li>• Life Insurance,</li> <li>• Life Annuities,</li> <li>• Benefit Premium</li> </ul>															
<b>Study and examination requirements and forms of examination:</b>	<p>The final mark will be weighted as follows:</p> <table border="1"> <thead> <tr> <th>No</th> <th>Assessment methods (components, activities)</th> <th>Weight (percentage)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Formulation the originality of research problem</td> <td>25%</td> </tr> <tr> <td>2</td> <td>Formulation the theoritical framework</td> <td>25%</td> </tr> <tr> <td>3</td> <td>Formulation the conjecture and metodhology</td> <td>20%</td> </tr> <tr> <td>4</td> <td>Presentation</td> <td>30%</td> </tr> </tbody> </table> <p>Final grade will be determined as follows:</p> <p>Grade Criteria</p> <p>A : <math>95 \leq \text{final mark} \leq 100</math>  A- : <math>90 \leq \text{final mark} &lt; 95</math>  A/B : <math>85 \leq \text{final mark} &lt; 90</math>  B+ : <math>78 \leq \text{final mark} &lt; 85</math>  B : <math>70 \leq \text{final mark} &lt; 78</math>  B- : <math>65 \leq \text{final mark} &lt; 70</math>  B/C : <math>60 \leq \text{final mark} &lt; 65</math>  C+ : <math>54 \leq \text{final mark} &lt; 60</math>  C : <math>48 \leq \text{final mark} &lt; 54</math>  C- : <math>40 \leq \text{final mark} &lt; 48</math>  C/D : <math>35 \leq \text{final mark} &lt; 40</math>  D+ : <math>30 \leq \text{final mark} &lt; 35</math>  D : <math>25 \leq \text{final mark} &lt; 30</math>  E : final mark &lt; 25</p>	No	Assessment methods (components, activities)	Weight (percentage)	1	Formulation the originality of research problem	25%	2	Formulation the theoritical framework	25%	3	Formulation the conjecture and metodhology	20%	4	Presentation	30%
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3	Formulation the conjecture and metodhology	20%														
4	Presentation	30%														
<b>Media employed:</b>	White/Black Board, LCD Projector, Laptop/Computer															
<b>Reading List:</b>	<p>The related references to the dissertation will be nominated as per the selected topic and content.</p> <p>General references:</p> <ol style="list-style-type: none"> <li>1. Bower, et.al (1999) Actuarial Mathematics, Society of Actuaries, Schaumburg, Illinois</li> <li>2. <a href="http://www.aktuaris.org">www.aktuaris.org</a></li> <li>3. <a href="http://www.soa.org">www.soa.org</a></li> </ol>															

### 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	√	√	√		√	√
CO 2	√	√	√		√	√
CO 3	√	√	√		√	√

### Programme Learning Outcomes (PLO) Doctoral Programme in Mathematics

<b>PLO-1</b>	<b>:</b>	<b>Attitude:</b>  Devote to God Almighty, uphold the humanity values, internalize academic values and ethics, responsible in working in the area of expertise independently.
<b>PLO-2</b>	<b>:</b>	<b>Knowledge:</b>  Mastering philosophy of mathematics and one of the fields in mathematics (algebra, analysis, applied mathematics, statistics, computational mathematics, computational statistics).

<b>PLO-3</b>	:	<p><b>Knowledge:</b></p> <p>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.</p>
<b>PLO-4</b>	:	<p><b>Skill:</b></p> <p>Creating new concepts and / or new methods (original) in the field of mathematics that are recognized nationally and internationally.</p>
<b>PLO-5</b>	:	<p><b>Skill:</b></p> <p>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.</p>
<b>PLO-6</b>	:	<p><b><i>Life Long Learning:</i></b></p> <p>Having lifelong learning skills and adaptive to the development of science and technology, especially in fields related to Mathematics and its applications.</p>