



## UNIVERSITI TEKNOLOGI MARA

### ASC505: PENSION MATHEMATICS

<b>Course Name (English)</b>	PENSION MATHEMATICS <b>APPROVED</b>
<b>Course Code</b>	ASC505
<b>MQF Credit</b>	3
<b>Course Description</b>	This course introduces the concept in pension mathematics. It focuses on various methods in valuing pension funding.
<b>Transferable Skills</b>	Demonstrate ability to analyze issues/problems from multiple angles and make suggestions.
<b>Teaching Methodologies</b>	Lectures, Tutorial
<b>CLO</b>	CLO1 Apply actuarial functions and techniques to pension mathematics CLO2 Construct the fundamentals of pension funding for retirement and related benefits CLO3 Demonstrate lifelong learning skill in financial management of pension schemes
<b>Pre-Requisite Courses</b>	No course recommendations
<b>Topics</b>	
<b>1. Pension Benefits</b> 1.1) Introduction to Pensions: Defined Contribution Plan and Defined Benefit Plan 1.2) Design of Pension Plans 1.3) Pension Plan Costing 1.4) Plan Documents and Funding 1.5) Actuarial Valuation 1.6) Notation and Terminology	
<b>2. Increasing Cost Individual Cost Method</b> 2.1) Traditional Unit Credit method for calculating Normal Costs, Accrued Benefits, Projected Benefits and Actuarial Liabilities 2.2) Benefits with a Salary Scale 2.3) Projected Unit Credit method for calculating Normal Costs, Accrued Benefits, Projected Benefits 2.4) Actuarial Liabilities and Unfunded Actuarial Liabilities	
<b>3. Level Cost Individual Cost Method</b> 3.1) Entry Age Normal (level dollar) method and Costs as a level percent of Salary for calculation of Normal Costs and Actuarial Liabilities 3.2) Entry Age Normal (level percent) for calculation of Normal Costs and Actuarial Liabilities 3.3) Individual Level Premium or calculation of Normal Costs and Actuarial Liabilities.	
<b>4. Aggregate Cost Methods</b> 4.1) Individual Aggregate Method for Calculation of Normal Costs and Actuarial Liabilities 4.2) Aggregate method for Calculation of Normal Costs and Actuarial Liabilities 4.3) Frozen Initial Liability	
<b>5. Experience Gains and Losses</b> 5.1) Principles of pension fund investment 5.2) Advantages and disadvantages of each asset class for final salary defined benefits schemes and money purchase schemes 5.3) Investment gains 5.4) Retirement gains and Unfunded Liability gains	

Assessment Breakdown	%
Continuous Assessment	40.00%
Final Assessment	60.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Group project CLO3 10%	10%	CLO3
	Test	Test 1 CLO2 5%	5%	CLO2
	Test	Test 2 CLO1 5%	5%	CLO1
	Test	Test 1 CLO1 10%	10%	CLO1
	Test	Test 2 CLO2 10%	10%	CLO2

Reading List	Recommended Text	<ul style="list-style-type: none"> <li>William H. Aitken 1996, <i>A Problem-solving Approach to Pension Funding and Valuation</i>, 2 Ed., ACTEX Publications [ISBN: 1566982006]</li> <li>Institute and Faculty of Actuaries 2020, <i>Core Reading: Subject CM1 Actuarial Mathematics Core Principles</i></li> </ul>
	Reference Book Resources	<ul style="list-style-type: none"> <li>Philip Booth, Robert Chadburn, Steven Haberman, Dewi James, Zaki Khorasane, Robert H. Plumb, Ben Rickayzen 2004, <i>Modern Actuarial Theory and Practice</i>, 2 Ed., Chapman and Hall/CRC</li> <li>Marco Micocci, Greg N.Gregoriou, Givanni Batista 2010, <i>Pension Fund Risk Management: Financial and Actuarial Modelling</i> Chapman and Hall</li> <li>David Blake 2006, <i>Pension Finance</i>, 1 Ed., Wiley</li> </ul>

Article/Paper List	This Course does not have any article/paper resources
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Other References	<ul style="list-style-type: none"> <li>Article Jeffrey R. Brown and George G. Pennachhi 2016, <i>Discounting pension liabilities: funding versus value</i>, Journal of Pension Economics &amp; Finance <a href="https://doi.org/10.1017/S1474747215000487">https://doi.org/10.1017/S1474747215000487</a></li> <li>Article Pierre Devolder and Roberta Melis 2015, <i>Optimal Mix Between Pay As You Go and Funding for Pension Liabilities in a Stochastic Framework</i>, International Actuarial Association, ASTIN Bulletin: The Journal of the IAA <a href="https://doi.org/10.1017/asb.2015.14">https://doi.org/10.1017/asb.2015.14</a></li> <li>Article James Naughton, Reining Petacchi and Joseph Weber 2015, <i>Public pension accounting rules and economic outcomes</i>, Journal of Accounting and Economics <a href="https://doi.org/10.1016/j.jacceco.2015.02.002">https://doi.org/10.1016/j.jacceco.2015.02.002</a></li> <li>Article Aleksandar Andonov 2017, <i>Pension Fund Asset Allocation and Liability Discount Rates</i>, Oxford Academic, The Review of Financial Studies <a href="https://doi.org/10.1093/rfs/hhx020">https://doi.org/10.1093/rfs/hhx020</a></li> <li>Article Sheila Rose Darmaraj and Suresh Narayanan 2019, <i>The Long-Term Financial Sustainability of the Civil Service Pension Scheme in Malaysia</i>, The MIT Press Journals, Asian Economic Papers <a href="https://doi.org/10.1162/asep_a_00670">https://doi.org/10.1162/asep_a_00670</a></li> </ul>
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