Actsc 612 Life Insurance Mathematics I

Syllabus

- Introduction to life Insurance; traditional and variable insurance contract design;

- The future lifetime random variable – complete \((T_x)\), curtate \((K_x)\) and \(1/\text{mthly} \text{ } (K_{x}^{(m)})\). Moments and distributions of the future lifetime RVs, including Makeham, Gompertz and Weibull models.

- Survival and mortality probabilities and functions, including \(n p_x, n q_x, u|n q_x, \mu_x(t)\) and select versions.

- Heterogeneity in populations; risk classification, underwriting, selection.

- Life tables and their uses; the life table functions for select and ultimate lives. UDD and constant force of mortality fractional age assumptions.

- Definitions, distributions, calculations of probabilities and moments for insurance benefit present value random variables, including standard international actuarial notation \((A_x, A_{x:\overline{\text{m}}}, A_{x}^{(m)}, \overline{A}_{x:\overline{\text{m}}}, A_{x}^{\frac{1}{\text{m}}}, \text{ etc})\).

- Definitions, distributions, calculations of probabilities and moments for annuity present value random variables, including standard international actuarial notation \((\ddot{a}_x, a_x, \ddot{a}_{x:\overline{\text{m}}}, a_{x:\overline{\text{m}}}, \ddot{a}_x^{(m)}, \ddot{a}_{x:\overline{\text{m}}}^{(m)}, \ddot{a}_x^{\frac{1}{\text{m}}}, a_{x:\overline{\text{m}}}^{\frac{1}{\text{m}}}, \text{ etc})\).

- The future loss random variable for insurance contracts.

- The equivalence principle for net and gross premium calculation.

- Extra Risks.

- Calculation of prospective reserves using the future loss random variable.

- Recursions for reserves.

- Thiele’s equation; solving the ODE.

- Asset shares and retrospective reserves.

- Sources of profit and loss; expected and actual death strain.
Notes: This course covers approximately 40% of the material of CT5. The rest is covered in Actsc 623 below. This course covers around 40% of the material for the SOA course MLC.

Textbook: It is intended to use the forthcoming text *Actuarial Mathematics for Life Contingent Risk* by David Dickson, Mary Hardy and Howard Waters.

Contact Hours: 36 lectures, 10 tutorials.

Assessment: 65% final exam (unseen); 15% midterm exam (unseen); 20% assignments.