

## About the Actuarial Science Programme

The Actuarial Science curriculum is designed for those who wish to pursue a career in various insurance, financial, and risk management areas as an actuarial professional. This three-year honours degree programme provides a solid and thorough grounding in modern actuarial skills. You will receive an all-rounded training, ranging from traditional actuarial mathematics, statistics, to financial economics.

The programme is accredited by the Institute and Faculty of Actuaries (IFoA). It is the only programme in Singapore to enjoy this recognition by one of the profession's most respected bodies. Accreditation enables you to obtain exemptions for most of the IFoA's associateship examinations, which form an important and foundational part of the professional requirements to qualify as an actuary. IFoA also sponsors the Sir Edward Johnston Award, with a £250 prize, for the best actuarial science student of each year's graduating cohort. The uniqueness of our curriculum design and exemption opportunity have attracted many bright students, both local and foreign, to undertake this specialisation over the past 15 years.

The work of an actuary requires strong analytical skills and is based on a multi-disciplinary background of mathematics, statistics, demographics, finance, data analytics, and economics. It involves the identification, assessment, and management of various risks faced by financial institutions such as market risk, credit risk, pricing risk, reserving risk, operational risk, and catastrophic risk. Equipped with such strong and diverse set of skills, together with effective communication skills, actuaries are highly capable to serve as financial advisors to a wide variety of organisations such as life, general, and health insurers, pension schemes, banks, consulting firms, and government departments. The types of work include risk analysis and management, design and pricing of insurance, retirement, and financial products, investment and financial management, capital adequacy and solvency assessment, and other emerging opportunity including InsureTech.

Actuaries are a highly regarded profession worldwide. The actuarial profession has been ranked within the best three jobs by Jobs Rated Almanac in the US for almost every year since 1988, based on such criteria as income, prospects, security, stress, and work environment. In the US, UK, Australia, and Asia-Pacific, a recently qualified actuary with a few years of post qualification experience would earn approximately \$120,000+ per annum, while more senior and experienced actuaries would earn \$250,000+ per annum. With continual growth of the life and general insurance sectors, recent international regulatory changes in general insurance, increasing awareness of appropriate risk management, expansion of actuarial skills into finance, investment, and big data areas, and rapidly developing markets in Asia (According to Chinese media reports, it is forecast that China needs around 5,000 more actuaries in the next ten years to sustain its growth in insurance and finance sectors), global demand for actuarial talent is substantial. There is also much scope to pursue a career in actuarial research. IFoA funds PhD scholarships for actuarial science graduates in Asia to pursue actuarial science research at the Actuarial Research Centre in Edinburgh. All in, an actuarial career is undeniably a flourishing and fruitful one.

For more information about actuarial science at Nanyang Business School, please explore the following links:

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## **Admission Requirements for Specialisation in Actuarial Science**

You can pursue actuarial training at Nanyang Business School by enrolling in the Bachelor of Business Actuarial Science single- or double-degree programme. In order to be admitted into the Actuarial Science programme, you would have to perform well in your first year in the following courses:

- AC1101 Accounting I / AC1103 Accounting I / AD1101 Financial Accounting
- AB1201 Financial Management
- AB1202 Statistics & Analysis

Stringent requirements are meant to ensure that only well qualified students are admitted into the Actuarial Science programme. Do make a balanced assessment of your interests and abilities before committing yourself to a decision to enrol in the programme. Foremost among the qualities you ought to have to succeed in the programme are strong analytical and mathematical abilities.

## Professional Examination Exemptions

To enhance your career as an actuary, you are recommended to work towards becoming a Fellow of the Institute and Faculty of Actuaries (IFoA) or of an equivalent body (e.g. Society of Actuaries (SOA), Casualty Actuarial Society (CAS), Institute of Actuaries of Australia (IAA)). This requires you to pass a series of professional examinations administered by the professional actuarial organizations.

The Actuarial Science programme at Nanyang Business School is accredited by IFoA. This means that, subject to approval, you will be able to obtain exemptions for most of IFoA's associateship level core principles subjects. Qualification for exemption of these subjects depends on:

- Overall grades of the student; and
- Approval by the external examiner.

The process of assessing student grades for exemptions will be carried out once a year and after graduation.

The table below shows how IFoA's new Curriculum 2019 links to our ACS Programme for exemptions

Institute and Faculty of Actuaries (IFoA)	Nanyang Business School
CS1 Actuarial Statistics	BA2203 Statistical Modelling (50%) BA3202 Actuarial Statistics (30%) BA3205 Actuarial Computing (20%)
CS2 Risk Modelling and Survival Analysis	BA2204 Models (50%) BA3202 Actuarial Statistics (30%) BA3205 Actuarial Computing (20%)
CM1 Actuarial Mathematics	BA3201 Life Contingencies and Demography (50%) BA2202 Mathematics of Finance (30%) BA3205 Actuarial Computing (20%)
CM2 Financial Engineering and Loss Reserving	BA3203 Actuarial Aspects of Asset Valuation (50%) BA2202 Mathematics of Finance (30%) BA3205 Actuarial Computing (20%)
CB1 Business Finance	AB1201 Financial Management (50%) AC1101 Accounting I / *AC1103 Accounting I / AD1101 Financial Accounting (50%)
CB2 Business Economics	BA2201 Actuarial Economics (100%)

## **Examinations Waivers for other Professional Actuarial Bodies**

As an accredited IFoA university program, students who receive exemption/credits for the IFoA subjects may apply for waivers for actuarial examinations offered by other professional actuarial bodies such as the Society of Actuary (SOA), Casualty Actuarial Society (CAS), and the Institute of Actuaries of Australia (IAA). For example, table below shows the correspondence examinations between SOA and IFoA.

<b>IFoA Examination Exemptions/Credits</b>	<b>Waivers from SOA Examination</b>
CS1 (Actuarial Statistics 1)	Exam P (Probability)
CM1 (Actuarial Mathematics 1)	Exam FM (Financial Mathematics)
CM1 (Actuarial Mathematics 1) CS2 (Actuarial Statistics 2)	Exam LTAM (Long-Term Actuarial Mathematics)
CM2 (Actuarial Mathematics 2) CS1 (Actuarial Statistics 1) CS2 (Actuarial Statistics 2)	Exam STAM (Short-Term Actuarial Mathematics)
CM2 (Actuarial Mathematics 2)	Exam IFM (Investment and Financial Market)
CS1 (Actuarial Statistics 1)	VEE Mathematical Statistics
CB1 (Business Finance)	VEE Accounting and Finance
CB2 (Business Economics)	VEE Economics
CS2 (Actuarial Statistics 2) CP2 (Core Practice 2)	Exam SRM (Statistics for Risk Modeling)

For more details of the examinations waiver, please visit the websites of the [Society of Actuaries](#), [Casualty Actuarial Society](#), and the [Institute of Actuaries of Australia](#) for more information.

## **Society of Actuaries' Actuarial College Listing**

Nanyang Business School's Actuarial Science programme is qualified as an *UCAP-Advanced Curriculum (UCAP-AC)* under the [SOA's Universities and Colleges with Actuarial Programs \(UCAP\)](#). This qualification is recognition of the programme for providing courses that cover fundamental concepts and actuarial techniques for modelling and managing risks, preparing students for Associateship examinations, and offering a degree in Actuarial Science. Some other universities in the list are City University, Boston University, Columbia University, Georgia State University, Peking University, and University of Waterloo.

Apart from applying for waivers as stated above, you may take the following courses in Nanyang Technological University to obtain credits for the Society of Actuaries' three [Validation by Educational Experience \(VEE\) courses](#) (Economics, Mathematical Statistics, and Accounting & Finance).

<b>Society of Actuaries VEE Courses</b>	<b>Nanyang Technological University Courses</b>
VEE Economics	AB0901 Principles of Economics
VEE Accounting and Finance	AD1101 Financial Accounting I AB1201 Financial Management
VEE Mathematical Statistics	BA2203 Statistical Modelling

## **Areas of Practice**

### Life Insurance

Actuaries have traditionally worked in life insurance. They are involved in assessing the financial stability of the company, evaluating reserves, determining premium scales, designing new products, assessing and monitoring risks, testing profitability, allocating surplus, and general management.

### General Insurance

In recent years there has been significant growth in the number of actuaries working in general insurance. This trend has been inspired by international regulatory changes and an increasing awareness of proper assessment of general insurance liabilities. The opportunities in this area are tremendous and the types of work are challenging. Actuaries apply sophisticated statistical models to evaluate the risks in different lines of business such as motor, marine, fire, accident, travel, public liability, product liability, and workers' compensation.

### Health Insurance

Many countries are restructuring their welfare systems and health insurance is now under significant public interest. Actuaries apply their modelling and analytical skills to different health insurance problems, such as modelling multiple states of sickness, pricing insurance products, calculating sufficient reserves, and providing professional advices to health insurers and governments.

### Pensions

For some welfare countries and large financial institutions, pension schemes play a key role in retirement savings and pension funds form a significant source of investment funds. Actuaries use advanced mathematical models to project the cash flows of the pension schemes and make sure that the funds are properly invested in order to support the schemes. They have to consider various financial factors as well as complex legal and tax environment.

### Finance and Investment

Actuaries have been moving into the broad finance and investment areas over recent years. Actuaries are well known for their critical thinking, analytical ability, risk expertise, and long-term strategic perspective. These attributes are increasingly appreciated by banks and financial institutions, where actuarial advices are sought for risk management in different technical and managerial areas.

### Consultancies

A significant portion of actuaries work in consulting firms. They provide specialised actuarial services to insurers, furnish high level advices on purchase and sale of insurance companies, and fulfil statutory roles for those insurers which do not employ in-house actuaries. These firms often act on the forefront of the profession in dealing with newer kinds of work in various financial and non-traditional areas.

### Enterprise Risk Management

Due to worldwide regulatory changes, enhancing complexity of markets and risks, and greater emphasis on controlled risk-taking, Enterprise Risk Management (ERM) has recently gathered significant attention amongst financial institutions around the world. Actuaries are now actively seeking opportunities in this area. In particular, ERM is mainly about identifying, assessing, and managing all sorts of risks faced by financial institutions. Some examples of these risks are market risk, credit risk, pricing risk, reserving risk, and operational risk. This practice area has huge potential and actuaries' skill sets and risk expertise are very well placed in this aspect.

### New Areas

An increasing number of actuaries are switching into non-traditional areas. Some examples are data analytics, genetics, climate change, environment, and information technology. Opportunities for candidates with actuarial expertise are constantly evolving. It is up to the candidate's desire to take on challenges and his or her ability to apply actuarial techniques and judgment to broader and unexplored areas.

## Employers

The following is a non-exhaustive list of some of the insurance and financial institutions that have recruited Nanyang Business School's actuarial students:

### DIRECT LIFE INSURANCE

- AXA Life
- Manulife
- Prudential Assurance
- Swiss Life
- The Great Eastern Life
- Tokio Marine Life
- Zurich Life

### DIRECT GENERAL INSURANCE

- ACE Insurance
- AIG Asia Pacific Insurance
- Allianz Insurance
- Cigma International
- Liberty Insurance
- MSIG Insurance
- Tokio & Marine Insurance
- Zurich Insurance

### REINSURANCE

- Allianz SE
- Cologne Re
- Hannover Re
- MS Frontier Reinsurance
- Munich Re
- Pacific Life Re
- Partner Re
- RGA Reinsurance
- SCOR Global SE
- Swiss Re
- Tokio Marine Retakaful

### COMPOSITE INSURANCE

- AIA Singapore
- Aviva Limited
- HSBC Insurance
- NTUC Income

### CONSULTANCY

- Carrots Consulting
- Deloitte
- Ernst & Young
- KPMG
- Milliman
- NMG
- PricewaterhouseCoopers
- Willis Towers Watson

### BANKS/ASSET MANAGEMENT

- ANZ
- Citibank
- DBS
- Deutsche Bank
- GEREJE Corporate Finance
- Pivot Capital
- UOB

### BROKERS

- Aon
- Guy Carpenter

### GOVERNMENT

- Monetary Authority of Singapore (MAS)
- Government Of Singapore Investment Corporation (GIC)

Fresh graduates are often employed as trainees by insurance and financial companies and consulting firms. Further actuarial examinations can be taken for career advancement. With experience, fully qualified actuaries can expect continual growth and promotion within their organisations and may be given broader managerial responsibility.

There is also a Global Internship Programme which is open to all second year students and takes place during the semester break from May to July. During the 12 weeks of the programme, interns will be attached to one or more business units from various participating general insurance industry leaders such as Lloyds Asia, QBE, Royal SunAlliance, AIG, Allianz, and the Benfield Group. Overseas attachment opportunities include Dubai, London, Munich, New York, Sydney, Tokyo, and Zurich. Please refer to [General Insurance Association of Singapore](#) for more information.

## Recent Graduates

### Huang Shimeng (Class of 2020)

Shimeng is a recent graduate from the NBS Accounting and Business Double Degree Programme with a specialization in Actuarial Science. She was awarded the Nanyang Scholarship, Aviva Ltd Gold Medal, and MSIG Insurance Book Prize. She completed three industrial attachments with insurance and reinsurance companies, including China Pacific Life Insurance Company, Munich Re Singapore, and AXIS Capital, in both life and non-life sectors. She will be pursuing a PhD degree in the School of Business at the University of Wisconsin-Madison after graduation.

*“The NBS Actuarial Science programme has, indeed, been a fruitful learning experience where I was introduced to various statistical models for applications in the insurance and investment field. It is intriguing to explore how the uncertain future can be explained by probability theories and models. The rigorous curriculum has laid a solid quantitative foundation for me to pursue further studies in this area.”*

*Actuarial professors in NBS are very dedicated and approachable. They always do their best to help us grasp the challenging concepts and also provided us with career advice. The programme had also supported and helped us secure internships to gain a better understanding of how actuarial concepts were applied in real life with hands-on experiences. In addition, with a small and friendly Actuarial Science community, it is easy to build connections with peers and alumni who might be your most valuable assets.”*

### Tan Chong It (Class of 2010 and 2015)

Chong It is currently working as a Lecturer in Actuarial Studies at Australian National University. He spent 8 years in Nanyang Business School to complete both undergraduate (2010) and PhD (2015) studies. He was awarded the Nanyang Scholarship, Aon Benfield-NTU PhD Research Award and SCOR Actuarial Award. He is a Chartered Enterprise Risk Analyst and would be a Fellow of Society of Actuaries by late 2015.

*“My role as an academic involves a combination of research and teaching activities. Throughout my journey with NBS, I’ve developed a strong passion in teaching – by facilitating knowledge delivery and fostering curiosity – to enhance students’ learning experience. On the other hand, the solid academic rigor of Actuarial Science programme has prepared me with a set of quantitative skills that are required in undertaking research projects.”*

*Looking back, the learning experience with NBS Actuarial Science was truly amazing and enjoyable. I miss the four-hour seminars that were filled with technical concepts and occasional jokes; I vividly remember the intensive preparation before mid-term quizzes and final examinations; I greatly appreciate the advices and guidance provided by our dedicated actuarial professors. But above all, my most memorable experience (though it may sound strange) was the sense of accomplishment after spending numerous hours to complete all the actuarial tutorials -- priceless!”*

### Joshua Ong (Class of 2015)

Joshua has just started his career in UOB under the Management Associate Programme. After a 16-month rotation, he will join the Group Risk department which oversees the risk management framework and other risk-related projects at the group level. He was awarded the Aviva Ltd Gold Medal, PK Hwang and AG Mackenzie Prize and the Sir Edward Johnston Prize.

*“The NBS Actuarial Science programme has been thoroughly enriching and challenging in my years at NTU. Dealing with rigorous mathematics was no easy task. But precisely because of the thinking needed to grasp a difficult concept, there were plenty of opportunities to critically analyse the explanations given and ponder what the calculations mean or how some proofs are constructed. These skills of questioning and digging deeper are very transferable and have been my greatest takeaway from the course.”*

*The lecturers in the programme were some of the best I had met. They were funny, approachable in class and did their best to explain difficult concepts as clearly as possible. Teachers would also prompt us to think deeper, make connections to other concepts and see the big picture after tedious calculations. Their deep knowledge and ability to handle every question posed to them was impressive. Best of all, the small cohort encouraged closer interactions with my fellow classmates.”*

### Evelyn Foong Yi Quan (Class of 2014)

Yi Qian is part of the Asia Medical Costing team in Swiss Re. Her day-to-day work revolves around assisting clients in the region with product pricing, product development, and experience monitoring of their medical insurance portfolios. She was awarded the Lee Kuan Yew Gold Medal, Singapore College of Insurance Gold Medal cum Cash Award, Aviva Ltd Gold Medal and the Sir Edward Johnston Prize. Yi Qian has also completed the Core Technical level examinations with the Institute and Faculty of Actuaries and is working towards qualifying as Fellow.

*"The NTU Actuarial Science program was very helpful in developing my technical skills, allowing me to learn fast on the job. In addition, the soft skills gained from my time in Nanyang Business School have been critical for me to deliver quality work for my employer. In particular, project management skills have been of great use as I have to juggle work with multiple clients. Frequent client interaction also requires me to tap on the communication skills acquired from my university days.*

*What I appreciated the most about the Actuarial Science program was the dedication of our lecturers. They put in a lot of effort to customise their teaching to suit the learning style of their students. They also gave us very helpful advice on the actuarial working environment."*

### Yap Jen Ming (Class of 2013)

Jen Ming is currently working as a Senior Executive at the Actuarial Department of NTUC Income Insurance Co-operative Limited, the insurance arm of NTUC Social Enterprises. He specialises in valuation and reporting of life & health insurance. He has received the Aviva Ltd Gold Medal and the inaugural Sir Edward Johnston Prize as he emerged as the top actuarial science graduate of the class of 2013. Jen Ming has also completed the Core Technical level examinations with the Institute and Faculty of Actuaries and is working towards qualifying as Fellow.

*"The scope of actuarial work is very wide and at the same time requires highly specialized technical skills. Besides strong actuarial foundations to meet my day-to-day deliverables, I need to have effective communication and efficient time management. The ability to learn quickly and independently is also very crucial and highly sought-after in the labour market.*

*The NBS Actuarial Science Programme provides a comprehensive and rigorous training that is significantly essential and relevant to the actuarial job scope. The numerous presentations and discussions involved in the programme have enhanced my persuasion and critical thinking abilities, which proved to be extremely useful when I drive for changes to achieve process excellence in my workplace.*

*In the programme's internship placement, I was attached to the Actuarial Services Department of HSBC Insurance. That valuable experience not only exposed me to the corporate world of finance, it also strengthened my appreciation for independent learning. The NBS Actuarial Science Programme does not spoon-feed and helped to impart in me a strong ability to research and learn independently."*

### Ng Yen Siang (Class of 2013)

Yen Siang is an actuarial consultant in Ernst & Young Singapore. He has been working with life insurers in ASEAN in the areas of statutory valuation, Embedded Value reporting and actuarial model development. His work day typically involves reviewing actuarial investigations and developing modelling solutions.

*"In Singapore, actuarial consultants have many opportunities to work on overseas projects around the region. Clients would differ by size, and each market has different industry practices and regulatory environment. The contexts and requirements of each project are different; both sound professional judgments and strong technical skills are required to deliver high quality work consistently. The NTU actuarial science program has helped me build a strong technical foundation, which is essential in this line of work.*

*NTU actuarial science programme is recognized for training technically sound actuarial professionals. The curriculum possesses a good balance between academic and practical topics, and equips students with practical quantitative skills. As a life insurance professional, my daily work often involves application of actuarial mathematics, which I was rigorously trained in the Life Contingency and other modules. But more generally,*

*my biggest takeaway from the course is the training in around model thinking - structuring complex problems into logical parts in order to find appropriate solutions.*

*I was also pleasantly surprised that there is a large community of friendly alumni who are very willing to reach out and help students. You can often find many alumni returning to NTU during school events to share their work experience. Through them, many students have found good graduate and internship opportunities. Many of my friends and I had benefitted greatly through this close-knit alumni network.”*

## Further Information

You can find more information about the training of an actuary and the types of work involved. Some relevant links are:

- [Actuarial Science from Wikipedia](#)
- [Be an Actuary](#)
- [Actuary.com](#)

The following is a list of websites of actuarial institutes. Information about the professional actuarial examinations can be found at some of these websites:

- [Actuarial Foundation](#)
- [Actuarial Society of Hong Kong](#)
- [Actuarial Society of Malaysia](#)
- [Actuarial Society of South Africa](#)
- [American Academy of Actuaries](#)
- [Canadian Institute of Actuaries](#)
- [Casualty Actuarial Society](#)
- [Institute of Actuaries](#)
- [Institute of Actuaries of Australia](#)
- [Institute of Actuaries of India](#)
- [International Actuarial Association](#)
- [New Zealand Society of Actuaries](#)
- [Singapore Actuarial Society](#)
- [Society of Actuaries](#)
- [Society of Actuaries in Ireland](#)

For further information on the Actuarial Science programme at Nanyang Business School, please contact:

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