COURSE CONTENT FOR MH4908 (with Final Year Project)

Academic Year	Any	**Semester**	1, 2 and Special Term I & II
Course Coordinator	Wang Li-Lian		
Course Code	MH4908		
Course Title	Professional Internship I (Co-op)		
Pre-requisites	Approval by the Division of Mathematical Sciences		
Mutually Exclusive	MH4900 FYP, MH4902 OEP12, MH4903 PI, MH4904 OEP12, MH4905 OEP6, MH4906 OEP6, MH4909 PI II (Co-op)		
No of AUs	15		
Contact Hours	30 weeks		
Proposal Date	15 October 2018		

A. Course Aims

This 30-week Professional Internship is offered as a core course for all BSc in Mathematical Sciences (Cooperative Education Program) undergraduate students during Year 3 Semester 2+Special Semester I & II or Year 3 Special Semester I & II + Year 4 Semester 1. This is a 15AU-course.

The purpose of this internship is to enable the application of knowledge and skills you have learned in the university in an authentic work environment. This is such that you can gain relevant exposures and develop practical industry experiences and skills that will facilitate your career decision and future transition into your selected vocation. It aims for you to develop professional competencies that will enhance your employability and lifelong learning capabilities to support your career and life endeavours and your readiness for the future of work. In addition, you will have the option of completing an Industrial Final Year Project (IFYP) co-supervised by a company supervisor and an NTU faculty. The IFYP provides an opportunity to apply and integrate the knowledge you have gained through various subjects in your degree programme, and to demonstrate practical research skills through solving real life problems in related field.

B. Intended Learning Outcomes (ILOs)

At the end of the Professional Attachment, you (as a student) should be able to:

I. Cognitive

1. Apply knowledge and skills relevantly and appropriately in the workplace.
2. Identify your own competency gaps at the internship workplace.
3. Evaluate and develop personal learning and development pathways towards bridging competency gaps identified in point (2) above.
4. Develop and apply strategies to solve problems effectively (involves critical thinking and creativity, generating questions, resourcing, application, and reiteration). (E.g. develop methodology and plan to achieve project objectives, formulate appropriate research questions.)
5. Evaluate resources and develop insights to make informed judgements and recommendations. (E.g. conduct literature review on a research problem.)

II. Context

6. Discuss the internship organisation's nature and context of business.
7. Reflect on the organisational culture at the internship organisation.
8. Appraise the significance and impact of the project/work/assignment undertaken at the internship organisation.
9. Describe the career pathways within the internship organisation as well as the broader industry.

10. Reflect on personal and professional development needs within the internship organisation as well as the broader industry and set strategic goals for advancing along an intended career path.
11. Apply time and task management strategies effectively.

III. Relationship

12. Apply effective written and oral communication skills in professional settings when communicating and connecting with relevant stakeholders. (Communicate research proposal in oral/written document)
13. Assimilate into the work environment (people, team, hierarchy) and function effectively.

IV. Affective/Moral

14. Tolerate ambiguity and handle anxiety.
15. Contribute proactively to the internship organisation.
16. Demonstrate responsibility, integrity and professionalism in the fulfilment of all workplace and internship requirements.
17. Demonstrate the persistence to learn, overcome and improve.

V. Technical

18. Use tools that enable and facilitate effective project/work/assignment undertaken at the internship organisation. (This includes mathematical/software/computing tools for analysing and solving problems.)

C. Course Content

This internship programme, being a work-integrated education course, has its educational content embedded within the work environment and assignments that students will undertake at each internship organisation.
a.   It is relevant to the student's discipline of study;
b.   It provides the required internship duration;
c.   It provides sufficient structure and rigour that will enable students to achieve the intended learning outcomes listed above;
d.   It provides the appropriate workload for the stipulated internship period;
e.   It enhanced the career prospects of the student;
f.   The internship workplace is safe and conducive for student learning and development;
g.   The internship workplace is equipped with the necessary tools and resources for the internship work;
h.   The internship organisation has standing policies to safeguard the welfare of interns;
i.   The internship organisation supervisor possesses the competencies, experience, and commitment to provide guidance to the students;
j.   The internship organisation will use NTU's internship assessment scheme for students.
k.   The content of the Final Year Project project will vary depending on organization, which will be specified under the scope and objectives of each proposal.
l.   Proposals will be reviewed by both the NTU supervisor and the Organization supervisor.

D. Assessments

This is a Letter-Graded course with the final grade determined collectively by your NTU Supervisor, your Organisation Supervisor and an NTU Examiner.

Component	Course ILOs assessed	Programme Learning Outcomes assessed (see Annex 5)	Weighting	Team / Individual	Assessment Rubrics
Assessment of Work at Organization	1, 4, 5, 11, 12, 13, 14, 15, 16, 17, 18	A1, A2, A3, A4, B1, B2, B3, B4, C1, C2, D, E	20	Individual	See Annex 1 for rubric. Assessed by Organisation Supervisor
E-journals 1,2,3	1,2,3,4,5,6	A1, A2, A3, A4, B1, B2, B3, B4, C1, D, E	20	Individual	See Annex 2 for rubric. Assessed by NTU Supervisor
Final presentation	6,7,8,9,10, 12,18	A1, A2, A3, A4, B1, B2, B3, B4, C1	30	Individual	See Annex 3 for rubric. Assessed by Organization Supervisor, NTU Supervisor and NTU examiner
Final thesis report	1,4,5,12,18	A1, A2, A3, A4, B1, B2, B3, B4, C1, D, E	30	Individual	See Annex 4 for rubric. Assessed by Organization Supervisor, NTU Supervisor and NTU examiner
		Total	100%		

	Company supervisor	NTU supervisor	NTU examiner	total
Assessment of work at organization/E-journals	20	20	NA	**40**
Final presentation	10	10	10	**30**
Final thesis report	10	10	10	**30**
total	**40**	**40**	**20**	**100**

Breakdown of weightage:

E. Formative Feedback

Continuous feedback on progress and performance can be expected from student's internship organisation supervisor.

Student's faculty supervisor will also provide feedback through the student's internship e-journal submissions and/or site visits.

F. Learning and Teaching Approach

An internship is an experiential learning programme done in a professional setting. Students will be placed in an organisation for the entire internship period and will undertake work assignments and/or projects in the organisation. It is through such work in the real-world environment where students learn and develop the competencies and experiences relevant to the intended learning outcomes of this course.
Each student will be supervised by (1) an Organisation Supervisor at the internship organisation, and (2) a Faculty Supervisor in NTU.
The Organisation Supervisor will be the key person working with and interacting with the student on a day-to-day basis. The Faculty Supervisor from NTU will serve to facilitate student's learning and progress through interactions via e-journal submissions, email, phone, and/or visits. The Faculty Supervisor will also be each student's first point of contact for any matters arising from the internship. Student can also contact the respective Internship Programme Manager at NTU's Career and Attachment Office as an alternative.

For the Final Year project, both the Organization Supervisor and the NTU supervisor will provide guidance and feedback to the student on a regular basis.

G. Reading and References

NTU Student Internship Handbook
Please refer to the respective Professional Internship/Attachment Teamsites via NTU Studentlink for the Internship Handbook.

NTU Work-Integrated Education Blog - Career School
https://blogs.ntu.edu.sg/cao_internship/

Harvard Business Review: 6 Ways to Make the Most of Your Internship
http://bit.ly/2J81BU2

Huffington Post: 21 Ways to Make the Most of Your Internship
http://bit.ly/2kK6Fz5

Vault: How to Successfully Manage your Assignments:
http://bit.ly/2LNfrIX

H. Course Policies and Student Responsibilities

Please refer to the respective Professional Internship/Attachment Teamsites via NTU Studentlink for detailed Internship Policy and Procedures.

Further information can be obtained from NTU's Career and Attachment Office (CAO) via cao_internship@ntu.edu.sg.

I. Professional and Academic Integrity

An internship concerns work in a professional setting. As with good academic work, good professional work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of professional and academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values. Refer to this link for details:
http://www.ntu.edu.sg/ai/Pages/shared-values-honour-code.aspx

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of integrity in all the work you do as a student of NTU. Not knowing what is involved in maintaining integrity does not excuse professional and academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of professional and academic dishonesty, including and not limited to, plagiarism, fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your faculty supervisor if you need any clarification about the requirements of professional and academic integrity in the course.

J. Course Instructors

Your Faculty Supervisor for the period of your internship will be allocated to you after the placement process is completed.

This internship course is managed and administered by your school's internship course coordinator as well as NTU's Career & Attachment Office.

K. Planned Weekly Schedule

Your internship work schedule will follow that provided by your Internship Organisatio

Annex 1:

Assessment Rubrics for Assessment of Work in the Organisation (AWO)

Criteria for the assessment of student performance in the internship organisation by the organisation supervisor:

ILOs	Focus	Criteria
1	Knowledge and Skills	Able to apply knowledge and skills (whether prior or newly learned) appropriately in the workplace and/or projects/tasks.
4	Problem-solving	Able to solve problems systematically and effectively.
5	Resourcefulness	Able to source for relevant information to make informed judgement, decisions and/or recommendations.
11	Time and Task Management	Able to plan, organise, manage and complete assignments effectively and in a timely manner.
12	Written and Oral Communication	Able to communicate effectively and appropriately in writing and verbally.
13	Team Work	Able to function effectively with other colleagues/stakeholders in the work environment.
14	Adaptability	Able to function effectively under ambiguity and/or change.
15	Initiative	Able to remain consistently pro-active towards contributing to the work and/or organisation.
16	Responsibility	Consistently demonstrates commitment, responsibility, integrity, professionalism and ethical behaviour at the workplace.
17	Persistence to Learn and Improve	Consistently demonstrates persistence and grit to overcome challenges, to learn and improve continuously at the workplace.
18	Fluency with Tools	Able to use tools, whether software or hardware tools, (and learn new ones where necessary) proficiently to accomplish tasks and assignments.

Annex 2:

Assessment Rubrics for E-Journal 1, E-Journal 2, E-Journal 3

You are required to submit a total of three (3) e-journals and one (1) Final Thesis Report documenting and reflecting on your internship experience in relation to the relevant intended learning outcomes of this course.

The three e-journals (E-Journal 1, 2,3) will be assessed in week 5 , week 10, and week 20 during the internship. These are purposed to be formative assessments where you will receive feedback on your progress.

For the e-journal submissions, you are to present evidences and reflections on the ILOS listed in the assessment table. You do not need to cover all the ILOS in each of the e-journals, however you are expected to address these ILOS overall across the three journals. In particular, E-Journal 2 in

week 10 should be used to report about the progress on your Industrial Final Year Project. The e-journal submission link will be provided to you by CAO:

- Evidences can be provided in the form of text descriptions, photographs, or drawings (ensure you seek clearance from your internship organisation should sensitive information be involved).

- Reflect critically on the evidences and the experience producing them, relating them to how they demonstrated your achievement of the specific ILO (or how they helped you to do so): Particularly but should not be limited to - what were the tasks (or observations) and their contexts, actions taken (or lessons drawn) by you and their reasons, and results achieved? What did you learn (e.g. information, knowledge, skills)? Evaluate your own capabilities and attitude where appropriate.

- If you wish to provide further evidences and reflections on ILOs which you have covered in an earlier e-journal submission, you are encouraged to do so. Such new evidence(s) and reflection(s) should demonstrate your development and growth.

Criteria for E-Journals

Focus	Criteria
Evidence for each ILO	Evidence provided is relevant to and supports the ILO.
Reflection on each ILO	Critical and thoughtful reflection on the experience of achieving the ILO. Clear and concise articulation of thoughts.
Achievement of ILO	Conclusive achievement of ILO.

Annex 3: Assessment Rubrics for Final Presentation

Category	Scoring Criteria
Organization	The type of presentation is appropriate for the topic and audience.
	Information is presented in a logical sequence.
	Presentation appropriately cites requisite number of references.
Content	Introduction is attention-getting, lays out the problem well, and establishes a framework for the rest of the presentation.
	Technical terms are well-defined in language appropriate for the target audience.
	Presentation contains accurate information.
	Material included is relevant to the overall message/purpose.
	Appropriate amount of material is prepared, and points made reflect well their relative importance.
	There is an obvious conclusion summarizing the presentation.
	Ability to handle questions
	Speaker maintains good eye contact with the audience and is appropriately animated (e.g., gestures, moving around, etc.).
	Speaker uses a clear, audible voice.

Category	Scoring Criteria
Presentation	Delivery is poised, controlled, and smooth.
	Good language skills and pronunciation are used.
	Visual aids are well prepared, informative, effective, and not distracting.
	Length of presentation is within the assigned time limits.
	Information was well communicated.
Q & A	Ask questions and contribute to discussion in other research project presentation

Annex 4: Assessment Rubrics for Final Thesis Report

Category	Scoring Criteria
Organization	Materials are organized and presented in a clear, coherent and logical sequence. Sharp sense of beginning and end
	Correct use of referencing throughout, formatted in the correct scientific specification.
Content	Clear description of project's objectives, motivations, interpretation and explanation of research approach, process and findings.
	Technical terms are well-defined in language appropriate for the area.
	Report contains accurate information.
	Material included is relevant to the overall message/purpose.
	Appropriate amount of material is prepared, and points made reflect well their relative importance.
	Discussion and conclusions tie well with the problem statement and results obtained.
	Shows clear understanding of key concepts/theories, and interpretation of wider context issues.
	Strong links made between problem statement, claims made, tools used and results.
	Is the project a new initiative, or is it similar to a previous or ongoing project?

	Does the project involve very sophisticated theory or does it require heavy and challenging code development?
Originality	Has the student developed original models or original results, novel and creative application of existing techniques/discovery of new principles?
	Clarity and distinct originality of thought, with clear link to major topics from research materials, as well as important linked topics.

≥95: Have publication in a Tier 1 journal (truly exceptional cases)
≥90: Have paper ready for submission for publication
Please attach supporting documents for these cases.

Annex 5: MAS Programme Learning Outcomes

Graduates of MAS programmes should be able to

Competence	A1	(Understanding)	independently process and interpret mathematical theories and methodologies, and apply them to solve problems
	A2	(Rigour)	formulate mathematical statements precisely using rigorous mathematical language
	A3	(Intuition)	discover patterns by abstraction from examples
	A4	(Modern Tool Usage)	use computer technology to solve problems, and to communicate mathematical ideas
Creativity	B1	(Critical Thinking)	critically assess the applicability of mathematical tools in the workplace
	B2	(Analysis)	critically analyse data from a multitude of sources
	B3	(Interdisciplinarity)	build on the connection between subfields of mathematics to tackle new problems
	B4	(Creativity)	develop new applications of existing techniques
Communication	C1	(Communication)	present mathematics ideas logically and coherently at the appropriate level for the intended audience
	C2	(Teamwork)	work in teams on complicated projects that require applications of mathematics, and communicate the results verbally and in written form
Civic-mindedness	D	(Professionalism)	develop and communicate mathematical ideas and concepts relevant in everyday life for the benefits of society
Character	E	(Ethics)	act in socially responsible and ethical ways in line with the societal expectations of a mathematics professional, particularly in relation to analysis of data, computer security, numerical computations and algorithms