

<b>Academic Year</b>	2020/21	<b>Semester</b>	Special Terms
<b>Course Coordinator</b>	Prof. Lew Wen Siang		
<b>Course Code</b>	PH4416		
<b>Course Title</b>	Professional Attachment		
<b>Pre-requisites</b>	PH1104, PH1105, PH1106, PH1107, PH1198, PH1199, PH2101, PH2102, PH2103, PH2104, PH2198, PH2199 or by permission		
<b>Mutually Exclusive</b>	PH2900 PA I (Co-op), PH3900 PA II (Co-op), PH4406 PA, PH4407 PI, PH4412 PA, PH4413 PI, PH4417 PI, PH4420 PI, PH4900 PI I (Co-op), PH4901 PI II (Co-op)		
<b>No of AUs</b>	5 AUs		
<b>Contact Hours</b>	10 weeks		
<b>Proposal Date</b>	December 2020		

### A. Course Aims

This 10-week Professional Attachment is offered as an Unrestricted Elective course for all BSc in Physics and Applied Physics undergraduate students matriculated in AY16/17 or later.

The purpose of this Professional Attachment 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.

### B. Intended Learning Outcomes (ILO)

Upon the successful completion 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. [Apply relevant science and engineering knowledge, logical reasoning, mathematical and computational skills to analyse, model and solve problems].
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, i.e., identify technical skills needed to solve problems.
4. Develop and apply strategies to solve problems effectively.
5. Evaluate resources and develop insights to make informed judgements and recommendations. Able to source relevant scientific/non-scientific information and conduct effective discussion.

#### 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.

[Perform rigorous information search and review of literature that is related to the preparation of the work. Information is well organised and presented in written report with appropriate layout].

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 in the broader industry and set strategic goals for advancing along an intended career path.
11. Apply time and task management strategies effectively. Project execution is well planned and quality work is produced.

[Able to put interpreted and discussed results into context, with good understanding of the underlying assumptions and limitation while being rationale to various approaches. Logical statements are used to conclude the outcome of the project with proposed solutions for future work].

### **III. Relationship and Communication**

12. Apply effective written and oral communication skills in professional settings when connecting with relevant stakeholders. [Able to convey scientific and non-scientific ideas effectively in writing and oral to professionals and to the general public.]
13. Assimilate into the work environment (people, team, hierarchy) and function effectively

[Taking initiative to communicate with team/project leader and working closely with colleagues. Able to contribute as a valued team member in the work environment.]

### **IV. Work Standard, Ethics and Personal Discipline**

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. Adhere to the code of conduct, rules and regulations. Behaving ethically and morally when performing a task.
17. Demonstrate the perseverance to learn, overcome and improve.

### **V. Technical Knowledge and Skills**

18. Use tools that enable and facilitate effective project/work/assignment undertaken at the internship organisation.

[Demonstrate the ability to analyse and interpret information. Apply fundamental physics and engineering concepts to evaluate results and formulate appropriate action plans.]

[Able to give a clear and concise presentation, with logical technical points conveyed. Appropriate choice of words, understandable, proper pace, good timing and informative presentation materials].

### C. Course Content

This attachment 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. For this reason, the attachment job scope will be evaluated by the course instructor/coordinator using the following criteria:

- a. It is relevant to the student's discipline of study;
- b. It provides the required attachment duration;
- c. It accommodates NTU's attachment periods;
- d. It provides sufficient structure and rigour that will enable students to achieve the intended learning outcomes listed above;
- e. It provides the appropriate workload for the stipulated attachment period;
- f. It enhanced the career prospects of the student;
- g. The attachment workplace is safe and conducive for student learning and development;
- h. The attachment workplace is equipped with the necessary tools and resources for the attachment work;
- i. The internship organisation has standing policies to safeguard the welfare of interns;
- j. The internship organisation supervisor possesses the competencies, experience, and commitment to provide guidance to the students;
- k. The internship organisation will use NTU's attachment assessment scheme for students.

### D. Assessment (includes both continuous and summative assessment)

This is a Pass/Fail course with the final outcome determined collectively by the Faculty Supervisor and the Organisation Supervisor.

The assessments will be based on the intended learning outcomes (ILO) in section B above and you should familiarise yourself with them as they will be your focus throughout the attachment.

Your Organisation Supervisor will assess your performance at the internship workplace through an evaluation form "Assessment of Work in the Organisation" (AWO). He/She will complete this evaluation at the end of your attachment.

Your Faculty Supervisor will facilitate and assess your learning, development, and growth through your E Journal submissions. The E Journal and final presentation are where you will reflect on your experience, learning, growth and achievement of the relevant ILOs. Keep the ILOs in mind throughout your experience and undertake or seek challenges in the workplace that will provide you with opportunities to generate experience and evidences regarding your competencies.

Component	Course ILOs assessed	Graduate Attributes assessed (Refer to Annex 5 for PAP Graduate Attributes)	Weightage	Team / Individual	Assessment Rubrics
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<p>Assessment of Work in the Organisation (AWO).           This component evaluates intern's performance at the workplace.</p>	<p>1, 4, 5, 11, 12, 13, 14, 15, 16, 17, 18</p>	<p>Competency 4-6          1-3,7 only for selected internship           Creativity          Communications          Character          Civic Mindedness</p>	<p>50</p>	<p>Individual</p>	<p>See Annex 1 for rubric.           Assessed by Organisation Supervisor at the end of your internship.</p>
<p>E Journal 1</p>	<p>1, 6, 7</p>	<p>Competency 4-6          1-3,7 only for selected internship           Creativity</p>	<p>10</p>	<p>Individual</p>	<p>See Annex 2 for rubric.           Assessed by NTU Faculty Supervisor.</p>
<p>E Journal 2</p>	<p>2, 4, 5</p>	<p>Communications          Character          Civic Mindedness</p>	<p>10</p>	<p>Individual</p>	<p>See Annex 2 for rubric.           Assessed by NTU Faculty Supervisor.</p>
<p>Final E Journal and Oral Presentation</p>	<p>3, 8, 9, 10, 12</p>		<p>30</p>	<p>Individual</p>	<p>See Annex 3           Assessed by NTU Faculty Supervisor</p>
<p><b>Total</b></p>			<p><b>100%</b></p>		

### **E. Formative feedback**

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

Student's faculty supervisor will also provide feedback through the student's attachment E Journal submissions and/or site visits.

### **F. Learning and Teaching approach**

An attachment is an experiential learning programme done in a professional setting. Students will be placed in an organisation for the entire attachment 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 Organisation Supervisor will be one providing guidance and feedback to the student on a regular 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 attachment. Student can also contact the respective Internship Programme Manager at NTU's Career and Attachment Office as an alternative.

### **G. Reading and References**

List of readings and references are dependent on the organization requirements. Your supervisor will recommend the list of readings and references related to your work.

#### **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 – WIE ARISE**

<https://blogs.ntu.edu.sg/wie-arise/>

#### **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](mailto: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 attachment will be allocated to you after the placement process is completed.

This attachment 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 detail attachment work schedule will follow that provided by your Attachment Organisation with the following check points with your NTU supervisor.

Week	Key Meetings (with NTU supervisors)	Readings/ Activities
1-2	-	Weekly updating logbook.
3	Review of E Journal 1 and performance in first 3 weeks.	
4-5	-	
6	Review of E Journal 2 and performance in first 6 weeks.	
7-9	-	
10	Submission of final E Journal and give oral presentation.	

**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:

<b>ILOs</b>	<b>Focus</b>	<b>Criteria</b>
1	Knowledge and Skills	Able to apply knowledge and skills (whether prior or newly learned) appropriately in the workplace and/or projects/tasks.  [Able to put together analytical, mathematical and/or computational skills to solve quantitative problems.]
4	Problem-solving	Able to solve problems systematically and effectively.  [Scientific approach to problem solving]
5	Resourcefulness [Awareness of relevant knowledge, skills needed]	Able to source for relevant information to make informed judgement, decisions and/or recommendations.  [Able to handle information critically and propose systematic approaches to handling problems.]
10	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	Perseverance to Learn and Improve	Consistently demonstrates persistence and grit to overcome challenges, to learn and improve continuously at the workplace, particularly in technological tools.
18	Skilfulness with Tools	Able to use tools, whether software or hardware tools, (and learn new ones where necessary) proficiently to accomplish tasks and assignments.

Please refer to detailed assessment rubrics.



## Annex 2: Assessment Rubrics for E Journal 1 and E Journal 2

You are required to submit a total of two (2) E Journals documenting and reflecting on your attachment experience in relation to the relevant intended learning outcomes of this course.

The two (2) E Journals will be assessed in week 3 and week 6 during the attachment. These are purposed to be formative assessments where you will receive feedback on your progress.

For each of these E Journals submissions, you are to present reflections on each of the specified three (3) ILOs indicated in section D above. The E Journal guide and template will be provided to you at the start of your attachment:

- Reflect critically on the experience, 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.
- E Journals should focus on another 3 ILOs as specified.

### Criteria for E Journal 1 (Week 3) – 10%

Focus	Criteria
Reflection on each ILO	Critical and thoughtful reflection on the experience of achieving the ILO. Clear and concise articulation of thoughts.

Please see assessment rubrics details attached.

### Criteria for E Journal 2 (Week 6) - 10%

Focus	Criteria
Reflection on each ILO	Critical and thoughtful reflection on the experience of achieving the ILO. Clear and concise articulation of thoughts.

Please see assessment rubrics details attached.

**Annex 3:  
Assessment Rubrics for Final E Journal and Oral Presentation**

**Final E Journal**

Your Final E journal submission will be assessed at the end of your attachment.

For this final submission, your focus is to cover the remaining ILOs listed and present evidences and reflections on them. In addition, an overall reflection on your attachment experience as a whole is expected:

- Reflect critically on the experience, relating them to how they demonstrated your achievement of each 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? How are the achievements validated (by supervisor, colleagues, stakeholders, etc.)? What did you learn (e.g. knowledge, skills)? How will you do things differently and better?
- Your overall attachment reflection will include but not limited to: Your overall experience in the attachment, what are your strengths and weaknesses? Did the experience affirm or revealed them? How will you build up your strengths and reduce your weaknesses? How do you now view this industry and this sort of work? What alternatives will you consider? Knowing what you now know, what are your tentative career plans after graduation? What will you do from this point onwards to put those plans in act?

**Final Oral Presentation**

As part of your final completion for this Professional Attachment, you are required to do an individual presentation to your Faculty Supervisor with the following guidelines:

ILO	Focus	Criteria Description
5	Resourcefulness	Able to source for relevant information to make informed judgement, decisions and/or recommendations.
8	Project Impact	Appraise the significance and impact of the project/work/assignment undertaken at the internship organisation
12	Written and Oral Communication	Able to communicate effectively and appropriately in writing and verbally (including listening).  Able to give a clear and concise presentation, with logical technical points conveyed. Appropriate choice of words, understandable, proper pace, good timing and informative presentation materials

17	Perseverance to Learn and Improve	Consistently demonstrates persistence and grit to overcome challenges, to learn and improve continuously at the workplace.
18	Skilfulness with Tools	Able to use tools, whether software or hardware tools, (and learn new ones where necessary) proficiently to accomplish tasks and assignments.

Please see assessment rubrics details attached.

This presentation will be based on the content in the Final E Journal. You are given 20 mins to present followed by a 10-min Question and Answer session.

Category	Scoring Criteria
<b>Organization</b>	The presentation is pitched at an appropriate level for the topic and audience.
	Information is presented in a logical sequence.
<b>Content</b>	Introduction captures attention; the problem is well defined 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.
<b>Delivery</b>	Speaker maintains good eye contact with the audience and is appropriately animated (e.g., gestures, moving around, etc.).
	Speaker uses a clear and audible voice.
	Delivery is poised, controlled, and smooth.
	Good language skills and pronunciation.
	Visual aids are well prepared, informative, effective, and not distracting.
	Length of presentation is within the assigned time limits.
	Content is presented in a clear and concise way.
<b>Q &amp; A</b>	Able to answer questions in a way that reflects a good understanding of the internship.

Please see attached spreadsheet for assessment rubrics.

**Criteria for Final E Journal and Oral Presentation submission (30%):**

<b>Focus</b>	<b>Criteria</b>
Reflection on each ILO	Critical and thoughtful reflection on the experience of achieving the ILO. Clear and concise articulation of thoughts.
Oral Presentation	Articulate achievement of ILO.

Please see assessment rubrics details attached.

**Annex4**

**Graduate Attributes**

***What we want our graduates from Physics and Applied Physics to be able to do:***

Upon the successful completion of the PHY, APHY and PHMA programs, graduates should be able to:

<b>Competency</b>	1	demonstrate a rigorous understanding of the core theories and principles of physics involving (but not limited to) areas such as classical mechanics, electromagnetism, thermal physics and quantum mechanics  [PHMA only] demonstrate a rigorous understanding of the core theories and principles of mathematical sciences involving (but not limited to) areas such as analysis, algebra and statistical analysis
	2	read and understand undergraduate level physics content independently;
	3	make educated guesses / estimations of physical quantities in general;
	4	apply fundamental physics knowledge, logical reasoning, mathematical and computational skills to analyse, model and solve problems;
	5	develop theoretical descriptions of physical phenomena with an understanding of the underlying assumptions and limitations;
	6	critically evaluate and distinguish sources of scientific/non-scientific information and to recommend appropriate decisions and choices when needed;
	7	demonstrate the ability to design and conduct experiments in a Physics laboratory, to make measurements, analyse and interpret data to draw valid conclusions.
<b>Creativity</b>	1	propose valid approaches to tackle open-ended problems in unexplored domains;

	2	offer valid alternative perspectives/approaches to a given situation or problem.

<b>Communication</b>	1	describe physical phenomena with scientifically sound principles;
	2	communicate (in writing and speaking) scientific and non-scientific ideas effectively to professional scientists and to the general public;
	3	communicate effectively with team members when working in a group.

<b>Character</b>	1	uphold absolute integrity when conducting scientific experiments, reporting and using the scientific results;
	2	readily pick up new skills, particularly technology related ones, to tackle new problems;
	3	contribute as a valued team member when working in a group.

<b>Civic Mindedness</b>	1	put together the skills and knowledge into their work in an effective, responsible and ethical manner for the benefits of society.
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