



**Program Structure and Specification**  
**Master of Science Program in Materials Science and Innovation**  
**(International Program)**  
**Curriculum Last Revised in 2020**  
**for**  
**Students Entering in 2<sup>nd</sup> term of Academic Year 2020**

---

- 1. Program Title**            Master of Science in Materials Science and Innovation  
 (International Program)
  
- 2. Name of Degree**  
 Full name:            Master of Science (Materials Science and Innovation)  
 Abbreviation:        MSc. (Materials Science and Innovation)
  
- 3. Responsible Units**
  - 3.1. Department of Chemistry, School of Science, Walailak University – Teaching Institution
  - 3.2. Department of Physics, School of Science, Walailak University – Teaching Institution
  - 3.3. Department of Petrochemical and Polymers, School of Engineering and Technology, Walailak University – Teaching Institution
  - 3.4. College of Graduate Studies, Walailak University – Awarding Institution
  
- 4. Philosophy and Expected Learning Outcomes of the Program**
  - 4.1. Philosophy of the Program:  
 To provide a comprehensive understanding of aspects related to the applications and development in Materials Science and Innovation today. We motivate our students to develop their ability to research, design, assess, implement and review solutions to real-life problems across a wide range of materials. This degree course prepares students to become independent, ethical and responsible Materials Science and Innovation professionals with a global appeal.
  
  - 4.2. Expected Learning Outcomes of the Program:  
 Expected Learning Outcomes of our Master of Science program are formulated according to the skills needed internationally for jobs in Materials Science and Innovation, feedback received from stakeholders and the past record of our three graduates' programs (Chemistry, Physics and Materials Science and Engineering) employment and the direction of the National Strategy (2018-2037): Upon completion of the doctoral program, graduates must be able to:



*Be a creative and critical thinker:*

1. Demonstrate broad and coherent knowledge of pertinent areas of materials science related to their field of interest.
2. Exhibit an in-depth understanding of the underlying principles and applications of the various instrumentation, techniques and/or software critical to their research projects.
3. Properly collect, analyse, assess, and evaluate the data gathered in their experiments to make logical, reasonable, and valid scientific arguments.

*Be an effective communicator:*

4. Effectively communicate the fundamental aspects of their field of interest as well as their research ideas and experimental results, both in oral and written form.

*Be a reflective life-long learner:*

5. Work efficiently in a highly dynamic, multi-cultural and interdisciplinary environment.
6. Acquire sufficient skills and competencies needed to embark on a professional career.

*Be a service-driven citizen:*

7. Always conduct themselves ethically and responsibly in the pursuit of their scientific and professional objectives.

## 5. Admission Requirements

- 5.1. Applicants for Type A1 must be studying in their final year at the bachelor level, or hold a B.Sc. degree (any area) or a bachelor's degree in Chemistry, Physics, Materials Science, or related area with a GPA of at least 3.25 or 3.00 with one publication.
- 5.2. Applicants for Type A2 must be studying in their final year at the bachelor level, or hold a B.Sc. degree (any area) or a bachelor's degree in Chemistry, Physics, Materials Science, or related area with a GPA of at least 2.50 or 2.00 with a GPA for the major subjects at least 2.75 or 2.00 with at least one year experience in materials science, chemistry or physics.
- 5.3. Applicants who are not English native, come from countries that use English as official language or graduate their bachelor's degree from countries that use English as native must have a TOEFL score of at least 450 (153 for computer-based or 45 for internet-based score), CEFR of at least B1 or an IELTS of at least 4.5. Applications must be submitted online via the College of Graduate Studies website (<https://grad.wu.ac.th/apply-now/>).
- 5.4. The entrance examinations are arranged by the Administrative Program Committee consisting of 1) English Proficiency Test (submit the English score), and 2) Subject-Specific Test, the latter involves an interview with the interview committee in English covering general knowledge in a topic of research interest, 3) Concept proposal, after interview the applicant will submit a concept proposal to the interview committee within four weeks.
- 5.5. Applicants may receive an exception to any of the requirements above, if permission is granted by the Administrative Program Committee in concurrence with the College of Graduate Studies.

## 6. Selection Method

Applicants are selected based on academic/research credentials, concept proposal and interview according to the rules and regulations of the program and the College of Graduate Studies, Walailak University. International applicants may be subject to a phone/online interview and must provide proof of financial support during the study period to be considered for admission. Final judgment will be made under the consideration of the Administrative Program Committee in concurrence with the Dean College of Graduate Studies, Walailak University.



## 7. Academic System

### 7.1. Semester system

Two semester system

### 7.2. Credit Assignment

The number of credits assigned to each subject is determined as follows:

- 7.2.1. Lecture or discussion consuming 15 hours per semester is equal to 1 credit hour.
- 7.2.2. Laboratory or practice consuming 30 hours per semester is equal to 1 credit hour.
- 7.2.3. Thesis consuming 45 hours per semester is equal to 1 credit hour.

## 8. Language

English is used in teaching and learning as well as in the assessment processes.

## 9. Registration

- 9.1. Students must register as full-time students.
- 9.2. Students must register for no less than 1 credit and no more than 15 credits per regular two mester, or according to program study plan.

## 10. Evaluation and Graduation Requirements

### 10.1. Evaluation

Student evaluation is in accordance with the oral, written and research assessments with the performance of the students marked against detailed rubrics or marking schemes.

### 10.2. Graduation Requirements

- 10.2.1. Students who are in program Type A1 must register for compulsory courses for which credits will not be counted, 6 credits for basic research skills and 2 credits of seminar work and 36 credits of thesis. The total credits acquired must be no less than 90 credits.
- 10.2.2. Students who are in program Type A2 must register for core courses 12 credits which include 6 credits for Developed research skills, 2 credits of Seminar and 4 credits for Advanced research skills. Selective courses for 6 credits and 18 credits of thesis. Total credits acquired must be no less than 36 credits.

### **All students must**

- 10.2.3. Pass the English Proficiency Examination offered by the College of Graduate Studies, Walailak University with a TOEFL score of at least 450 (153 for computer-based or 45 for internet-based score), CEFR of at least B1 or an IELTS of at least 4.5.
- 10.2.4. Present a thesis and pass an oral thesis examination according to the regulations of the College of Graduate Studies, Walailak University.
- 10.2.5. Publish at least one publications or a manuscript that has been accepted for publication in an international peer-reviewed journal according to regulations of College of Graduate Studies, Walailak University.

## 11. Library

The Center for Library Resources and Educational Media (CLM) possesses more than 10,000 books. Many journals can be accessed online. In addition, textbooks and journals (in both electronic and printed formats) are made available to the students.



## 12. Program Structure

### 12.1. The number of credits required for the program

12.1.1. Type A1, number of credits required for the program is no less than 36 credits (for research only)

12.1.2. Type A2, number of credits required for the program is no less than 36 credits (for research and coursework)

### 12.2. Curriculum Structure

The program is set according to the Ministry of Education Announcement titled “Standard Criteria for Graduate Studies 2015”, with specified Type A1 and A2 curricula.

#### 12.2.1. Type A1 (Research only)

1) Compulsory courses	8 credits*
a. Developed Research skills	6 credits
b. Seminar	2 credits
2) Thesis	36credits
<b>Total</b>	<b>36 credits</b>

\* All compulsory courses will not count as credits but must be graded as S.

#### 12.2.2. Type A2 (Research and coursework)

1) Core courses	12 credits
a. Developed Research skills	6 credits
b. Seminar	2 credits
c. Advanced research skills	4 credits
2) Selective courses	6 credits
3) Thesis	18 credits
<b>Total</b>	<b>36 credits</b>

### 12.3. Course Requirements

#### 12.3.1. Core courses

##### *Developed research skills*

MSI63-600	Skills for Research Scientists	2(1-3-3)
MSI63-601	Project planning and proposal writing	2(1-3-3)
MSI63-602	Technological Innovation and Entrepreneurship	2(1-3-3)

##### *Seminar*

MSI63-681	Seminar I	1(0-4-2)
MSI63-682	Seminar II	1(0-4-2)

##### *Advanced research skills*

MSI63-610	Dynamic Mechanical Analysing: A Practical Approach	2(1-2-3)
MSI63-611	Characterization of Engineering Materials: A Practical Approach	2(1-2-3)
MSI63-612	Density Functional Theory: Theory and Calculation	2(1-2-3)
MSI63-613	Numerical Simulations of Physical Phenomena	2(1-2-3)
MSI63-614	Computer aided instrumentation design and 3D printing	2(1-2-3)
MSI63-615	Computational modelling in science and engineering	2(1-2-3)



MSI63-616	Material Characterizations by Photon and Electron Beam	2(1-2-3)
MSI63-617	Principles and Applications of Molecular Spectroscopy	2(1-2-3)
MSI63-618	Principles and Applications of X-ray Diffraction	2(1-2-3)
MSI63-619	Electrochemical Methods	2(1-2-3)

**Note:** All basic research skills and seminar courses will not count as credits but must be graded as S for Type A1.

#### 12.3.2. Selective courses

MSI63-620	Functional Molecular Materials	3(3-0-6)
MSI63-621	Nanostructured Materials	3(3-0-6)
MSI63-622	Cellular Materials	3(3-0-6)
MSI63-623	Surface and surface modification for functional polymer	3(3-0-6)
MSI63-624	Materials for electrochemical applications	3(3-0-6)
MSI63-630	Chemistry for high performance elastomers	3(3-0-6)
MSI63-631	Modern Magnetic Materials	3(3-0-6)
MSI63-632	Physics of Crystal and its Defects	3(3-0-6)
MSI63-633	Acoustics in Fluids	3(3-0-6)
MSI63-634	Acoustics in Solids	3(3-0-6)
MSI63-635	Frontier in Coordination Chemistry	3(3-0-6)
MSI63-636	Crystal Engineering	3(3-0-6)
MSI63-637	Green Chemistry	3(3-0-6)
MSI63-640	Innovation of Materials Technology	3(2-2-5)
MSI63-641	Physics of plasmas and applications	3(2-2-5)
MSI63-642	Physics of microwave and applications	3(2-2-5)
MSI63-643	Materials and Product Innovation	3(2-2-5)
MSI63-710	Scientific Writing and Publishing	3(2-2-5)

#### 12.3.3. Thesis

MSI63-920	Thesis	36 credits
MSI63-921	Thesis	18 credits

#### 12.3.4. Research Projects of the Program

Staff at the Department of Chemistry, Department of Physics and Department of Petrochemical and Polymer has received many research grants from local agencies (e.g. National Science and Technology Development Agency (NSTDA), Thailand Research Fund (TRF), TRF-Golden Jubilee, National Research Council of Thailand (NRCT). Major research interests in the Departments are:

- Functional materials for medical, agricultural, and environmental applications.
- Magnetic materials for high density storage, quantum computer and thermal sensors.
- 2D and 3D materials for alternative energy storage.
- Wood technology and composites.
- Plasma and microwave technology for medical, agricultural, and environmental applications.



#### 12.4. Course Code Explanation

The course code in PhD program is composed of three letters followed by two numbers and a further set of three numbers, MSI63-XXX

**First set:** Three letters and two number

MSI meaning Materials Science and Innovation  
63 meaning The revision year (Buddhist calendar)

**Second set:** Three numbers

The first numbers represent postgraduate program level

6 meaning 1<sup>st</sup> year  
7 meaning 2<sup>nd</sup> year  
9 meaning Thesis

The second numbers represent course group

0 meaning Basic research skills  
1 meaning Advanced research skills  
2 meaning Materials science  
3 meaning Science  
4 meaning Innovation  
8 meaning Seminar

The third numbers represent an order in the course group

#### 12.5. Study Plan

##### Type A1 (Total credits 36)

Year	Term 1		Term 2	
<b>1</b>	MSI63-920 Thesis	10 Credits	MSI63-920 Thesis	10 Credits
	MSI63-600 Skills for Research Scientists *	2(1-2-3)	MSI63-681 Seminar 1*	1(0-3-2)
	MSI63-601 Project planning and proposal writing *	2(1-2-3)	MSI63-602 Technological Innovation and Entrepreneurship *	2(1-2-3)
	<b>Total</b>	<b>10 Credits</b>	<b>Total</b>	<b>10 Credits</b>
<b>2</b>	MSI63-920 Thesis	10 Credits	MSI63-920 Thesis	6 Credits
	MSI63-682 Seminar 2*	1(0-3-2)		
	<b>Total</b>	<b>10 Credits</b>	<b>Total</b>	<b>6 Credits</b>

\* Credits will not count but must be graded as S.

##### Type A2 (total credits 36)

Year	Term 1		Term 2	
<b>1</b>	MSI63-xxx Core course	2 Credits	MSI63-xxx Selective course	3 Credits
	MSI63-xxx Core course	2 Credits	MSI63-xxx Selective course	3 Credits
	MSI63-921 Thesis	2 Credits	MSI63-921 Thesis	3 Credits
	MSI63-600 Skills for Research Scientists	2(1-2-3)	MSI63-681 Seminar 1	1(0-3-2)
	MSI63-601 Project planning and proposal writing	2(1-2-3)	MSI63-602 Technological Innovation and Entrepreneurship	2(1-2-3)
	<b>Total</b>	<b>10 Credits</b>	<b>Total</b>	<b>12 Credits</b>
<b>2</b>	MSI63-921 Thesis	9 Credits	MSI63-921 Thesis	4 Credits
	MSI63-682 Seminar 2	1(0-3-2)		
	<b>Total</b>	<b>10 Credits</b>	<b>Total</b>	<b>6 Credits</b>



### 13. Thesis Research Proposal Examination

At the start of his/her study, the student must submit a document to the College of Graduate Studies for appointment of a Thesis Advisory Committee to provide guidance to the student regarding his/her preliminary research. After passing the qualifying examination, the student must submit a document to College of Graduate Studies for appointment of a Thesis Proposal Committee consisting of at least 3 faculty members, one of which is the student's major advisor while other two can be any academic staff within or outside Walailak University. After approval of the thesis proposal, this same committee will monitor and provide guidance to the student regarding his/her doctoral research.

### 14. Thesis Defense

Upon completion of the master degree research and the thesis, and with approval from the Thesis Advisory Committee, the student must submit a document to the College of Graduate Studies for appointment of a Thesis Defense Committee consisting of at least 3 members: a committee chair, who is an external examiner, a second internal examiner, and the Thesis Advisory Committee. After passing the oral thesis defense, the student can submit the final written thesis to the College of Graduate Studies.

### 15. Collaboration with Other Departments

Many of our faculty members are members of Centers of Excellence such as the Center for Excellence in Functional Materials and Nanotechnology (FuNTech), the Center for Excellence in Plasma Science and Electromagnetic Wave (PEWave) and the Center for Excellence in Wood Science and Engineering. We also have collaborations with scientists at other research institutes and universities in Thailand and overseas.

### 16. Students Job Opportunities

A Master's degree in materials science and innovation is the gateway to careers in a wide variety of industries ranging from the production of materials to the manufacturing. It also provides an ideal training for the innovative application of advanced materials in areas such as bio- and nanotechnology as well as a strong basis for those who wish to pursue a PhD degree in Materials Science or a related field.

