



**USM**

UNIVERSITI  
SAINS  
MALAYSIA

# POSTGRADUATE STUDIES

*School of*  
**CHEMICAL SCIENCES**

*chem.usm.my*

## **VISION**

To realise the aspiration of Universiti Sains Malaysia (USM) in Transforming Higher Education for a Sustainable Tomorrow.

## **MISSION**

- To produce chemistry graduates who are knowledgeable, highly skilled, well-mannered and possess excellent work ethics suited for the requirements of the public and industrial sectors.
- To provide chemistry students with quality education.
- To instill awareness among chemistry students towards the welfare of society.
- To provide modern facilities for chemistry teaching and research.
- To attract excellent students from Malaysia and abroad to study chemistry.

## **OBJECTIVES**

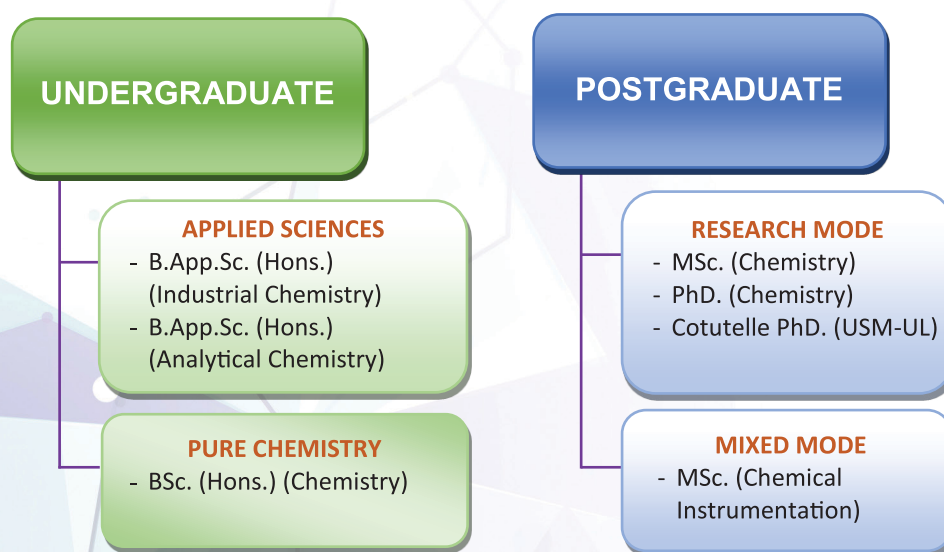
- To provide a broad, balanced and in-depth education in chemistry and related areas at the undergraduate and postgraduate levels.
- To develop students into graduates with sound theoretical and practical knowledge and the ability to apply knowledge to employment or further studies in chemistry or other related postgraduate programmes.
- To develop students in various skills including practical, social, communication, leadership and entrepreneurship skills.
- To develop students with the ability to assess and solve problems critically, logically and creatively.

## **INTRODUCTION**

The School of Chemical Sciences (SCS), established in 1969, is one of the pioneering schools of USM. With an academic staff of more than 30 and over 50 supporting staff, the School has been entrusted to provide professional training in chemistry to meet the demands of academic, industries and society.



## PROGRAMMES OFFERED



## POSTGRADUATE STUDIES

Students who are interested to pursue postgraduate studies can choose any of the following programmes:

- Full-time or part-time programme leading to degrees in Master of Science (MSc.) and Doctor of Philosophy (PhD.) by research.
- Full-time or part-time mixed mode programme (a combination of course work and research) leading to a Master of Science (MSc.) degree.

## SPECIALISATION

The School has given priority in creating a healthy research environment with a total of over 125 postgraduate students engaging in various areas of research including natural products, organic and inorganic syntheses, nanoscience, electrochemistry, liquid crystals, organometallics chemistry, environmental chemistry and materials chemistry. Our academic staff have been well endowed with research grants and funding from government bodies and industries to support these research activities.

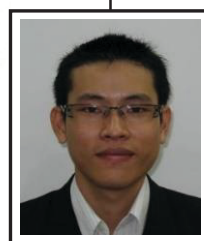
## MAIN ADMINISTRATIVE STAFF



**DEAN**



**DEPUTY DEAN  
(ACADEMIC, CAREER &  
INTERNATIONAL)**  
Assoc. Prof. Dr. Mohd Rizal Razali



**DEPUTY DEAN  
(RESEARCH, INNOVATION & INDUSTRIAL-  
COMMUNITY ENGAGEMENT)**  
Assoc. Prof. Dr. Ng Eng Poh



**PRINCIPAL ASSISTANT REGISTRAR**  
Dr. Subramaniam Govindan



**ASSISTANT REGISTRAR**  
Mr. Mohd Zuaril Akimi Mohd Shaari



**ADMINISTRATIVE ASSISTANT  
(PhD. & MSc. by Research) /  
(MSc. by Mixed Mode)**  
Mrs. Roziana Mohamed Idros

## MAIN ADMINISTRATORS

### DEAN

Prof. Dr. Rohana Adnan

## EXTENSION

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### Industrial Chemistry

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### Physical Chemistry

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### Analytical Chemistry

Dr. Dr. Mardiana Saaid

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## SENIOR LECTURERS

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## TECHNICAL STAFF

### SENIOR SCIENCE OFFICERS

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#### Analytical Chemistry

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**SENIOR ASSISTANT SCIENCE OFFICERS**

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**1<sup>st</sup> Year Lab/Store**

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**SENIOR LAB ASSISTANTS/ LAB ASSISTANTS**

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**SUPPORT / TECHNICAL STAFF**

**Electronic Workshop**

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**Glass Blowing Workshop/Store**

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## ADMINISTRATIVE STAFF

## EXTENSION

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### Deputy Dean Secretary

Siti Nor Aishah Abdul Rashid

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Idzhar Ahmat

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MAJOR EQUIPMENTS	LOCATION (G09/G09A)	EXTENSION
Atomic Absorption Spectrometer (AAS)	MUPA, K316	4059/2059
Carbon Hydrogen Nitrogen Analyser (CHN)	363	3579
Capillary Electrophoresis (CE)	K214	-
Differential Scanning Calorimeter (DSC)	K013	-
Electrochemical Systems	K316 / K011	-
Fourier Transform Infrared Spectrometer (FTIR)	370	3577/5032
Gas Chromatograph (GC)	MUPA, 274 & K213	4059/4040/4493
Gel Permeation Chromatograph (GPC)	K113	4038
Gas Chromatograph-Mass Spectrometer (GC-MS)	MUPA	4059
High Performance Liquid Chromatograph (HPLC)	K113, K213 & 377	4038/4040/5178
Inductively Coupled Plasma-Optical Emission Spectrometer (ICP-OES)	MUPA	4057
Liquid Chromatograph-Mass Spectrometer (LCMS)	MUPA	4059/4058
Nuclear Magnetic Resonance Spectrometer (NMR 500 MHz)	032	3589
Nitrogen Porosimeter	166	-
Polarised Optical Microscope (POM)	366	-
Thermogravimetric Analyser (TGA)	K013	4059
Total Organic Carbon Analyser (TOC)	364	-
Ultraviolet-Visible Spectrophotometers (UV-VIS)	175, 367 & 244	-
Analytical Services and Testing Laboratory (MUPA)	017	4057/4058/4059



## **FACILITIES**

The School is well equipped with teaching and research laboratories. Existing analytical and characterisation instruments include NMR, ICP-OES, GCMS, LCMS (TOF), TGA/DSC, GPC, TOC and CHN analyser, HPLC, GC, FTIR, FTIR with microscope, UV-Vis, AAS and fluorescence spectrophotometers, electrochemical systems and nitrogen porosimeter, POM, microwave digester and synthesiser, and other supporting equipments. The School is also equipped with electronics and glass-blowing workshops.

The expertise and facilities available in the School of Chemical Sciences are always tapped by the industries and government agencies in solving their problems. In line with the desire to improve the consultancy services offered by the School, the School of Chemical Sciences has taken a proactive step by setting up an Analytical Services and Testing Laboratory (MUPA) in year 2000 to offer more effective services for the industrial sectors.

### **Industry/Community Advisory Panel (ICAP) 2022-2024**

The creation of Industry/Community Advisory Panels within individual schools and centres of USM is in compliance with the university's overall efforts taken towards building a lighter working framework with industry, companies and the community. These ICAPs are considered timely and useful for enhancing institutional competitiveness. These panels comprise of selected academic staff, senior executives from the private sector and well-respected leaders from the community.

The ICAP meetings served as forums to discuss issues on curriculum, training solutions for coordinating industry/community expectations and relevance, best practices to be adopted, and practical approaches to address these contemporary issues and other areas of concern to all parties.

The ICAP panel members of the School of Chemical Sciences for 2022-2024 are:

No	NAME	POSITION & INDUSTRY
1.	Dato' Dr. Nasehir Khan E.M. Yahaya	Director, Water Quality Laboratory, NAHRIM, Seri Kembangan, Selangor.
2.	Mr. Thony Maratin Saba	Drilling & Fluids Advisor, Carigali Hess Operating Company, Kuala Lumpur.
3.	Dr. Yoga Sugama Salim	Senior Engineer, MATCOR Technology & Services, Singapore.
4.	Dr. Chan Kah Fai	Assistant General Manager, Texchem Polymers Sdn. Bhd., Prai, Penang.
5.	Dr. Hj. Mohd Afian Omar	Principal Researcher, Advanced Materials Research Centre (AMREC), SIRIM Berhad, Kulim, Kedah.

## MASTER OF SCIENCE (CHEMICAL INSTRUMENTATION) - MIXED MODE PROGRAMME

This programme was first introduced in the 2001/2002 academic session. It offers courses on various chemical instrumentations involving atomic spectroscopy, molecular spectroscopy, surface and thermal analysis, separation methods and environmental pollution and monitoring techniques. These courses will discuss the basic principles of various techniques and include hands-on operation of various instrumentations involved. The topics related to quality systems, intellectual property and research methodology are also offered as core courses. The candidate will undertake a short research project and submit a dissertation based on the project.

### Admission Requirements

A Bachelor of Science in Chemistry or related degree from a recognised university; **AND**

- i. CGPA at least 2.75/4.00; **OR**
- ii. CGPA 2.50-2.74/4.00 with
  - Research experience - 1 year; **OR**
  - Professional experience in the related field - 1 year; **OR**
  - One (1) academic publication in the related field; **OR**
  - Grade B for core subject / elective; **OR**
  - Grade B+ for undergraduate final year project; **OR**



iii. CGPA 2.00-2.49/4.00 (Bachelor degree with honours) with

- Research experience - 5 years; **OR**
- Professional experience in the related field - 5 years

**AND**

- One (1) academic publication in the related field; **OR**
- Grade B for core / elective subject; **OR**
- Grade B+ for undergraduate final year project.

**Note:** Students of other disciplines with chemistry background should take one (1) to two (2) theory subjects if it is deemed necessary by the Postgraduate and Research Committee.

### **Language Requirement**

Results must be uploaded via online application.

Applicable for international applicants only

- A minimum score of 35 in Internet-based TOEFL (Test of English as a Foreign Language); **OR**
- A minimum of Band 5 in IELTS (International English Language Testing System); **OR**
- A minimum score of 154 in Cambridge English Advance (CAE); **OR**
- A minimum score of 154 in Cambridge Proficiency Advance (CPE); **OR**
- A minimum score of 36 in Pearson Test of English (PTE); **OR**
- A minimum of Band 2 in MUET (Malaysian University English Test)

Exemption can be given if:

- English is the candidate's mother tongue or national language; **OR**
- The candidate graduated from an Institution of Higher Learning in which the medium of instruction is English

### **Duration:**

<b>Full-time:</b>	<b>Part-time:</b>
Minimum 2 semesters	Minimum 4 semesters
Maximum 4 semesters	Maximum 8 semesters



**Fees:**

Malaysian (MYR)	International (USD)
<ul style="list-style-type: none"> <li>Registration Fee: 340.00</li> <li>Tuition Fee: 265.00 × 40 units = 10,600.00</li> <li>Convocation Fee: 200.00</li> </ul>	<ul style="list-style-type: none"> <li>Registration Fee: 227.50</li> <li>Personal Bond: 1000.00</li> <li>Tuition Fee: 100.00 × 40 units = 4,000.00</li> <li>Convocation Fee: 50.00</li> </ul>

**COURSE STRUCTURE**

Total Unit for Graduation – 40 units	
Core Courses (Compulsory) – 24 units	
1. KAA509/20	Dissertation
2. KAA510/2	Quality Systems and Intellectual Property
3. KAA511/2	Research Methodology
Elective Courses (Choose 4 Courses) – 16 units	
1. KAA502/4	Atomic Spectroscopy
2. KAA503/4	Molecular Spectroscopy
3. KAA504/4	Electrochemical Methods
4. KAA505/4	Separation Methods
5. KAA507/4	Surface and Thermal Analysis

**Graduation Requirements**

- Pass Dissertation
- Pass the relevant courses (20 units) with minimum grade C+
- Minimum overall CGPA - 3.00
- All foreign students are required to register & pass LKM111 Malaysian Culture and Malay Language with minimum grade C
- Fulfill minimum period of candidature

Upon graduation, the MSc. (Chemical Instrumentation) graduates may consider to pursue the following programmes:

- PhD. (Research Mode) in USM.
- Master programme at Université de Lorraine (UL), France. Under this programme the candidate
  - Can be considered for entry into second year of a 2-year programme.
  - Will enter semester 3 in France and carry out a project in semester 4. The project will be carried out either in USM or UL.
  - Must possess a minimum CGPA of 3.00.
  - Has given presentation at conference(s) or has submitted a paper for publication.
  - Will bear all costs, accommodation, food and living expenses during his/her studies in France.
- Co-Tutelle Programme (between USM and UL). Under this programme
  - The research will be conducted in Malaysia and France.
  - A double PhD. degree is awarded from both institutions upon the completion of the programme.
  - The examination committee comprises of French and Malaysian experts.

**FULL-TIME STUDENTS:  
SEMESTER 1 - COURSES OFFERED**

Course Codes	Courses Offered	Core/Elective Courses
KAA503/4	Molecular Spectroscopy	Elective course
KAA507/4	Surface and Thermal Analysis	Elective course
KAA510/2	Quality Systems and Intellectual Property	Core course
KAA511/2	Research Methodology	Core course

**SEMESTER 2 - COURSES OFFERED**

Course Codes	Courses Offered	Core/Elective Courses
KAA502/4	Atomic Spectroscopy	Elective course
KAA504/4	Electrochemical Methods	Elective course
KAA505/4	Separation Methods	Elective course
KAA509/20	Dissertation	Core course

**PART-TIME STUDENTS\*:  
SEMESTER 1 - COURSES OFFERED**

Course Codes	Courses Offered	Core/Elective Courses
KAA503/4	Molecular Spectroscopy	Elective course
KAA507/4	Surface and Thermal Analysis	Elective course
KAA510/2	Quality Systems and Intellectual Property	Core course
KAA511/2	Research Methodology	Core course

\*Minimum one (1) course registered

**SEMESTER 2 & 3 - COURSES OFFERED**

Course Code	Courses Offered	Core/Elective Courses
KAA502/4	Atomic Spectroscopy	Elective course
KAA504/4	Electrochemical Methods	Elective course
KAA505/4	Separation Methods	Elective course
KAA509/20	Dissertation	Core course

\*Minimum one (1) course registered



## SYNOPSIS OF COURSES OFFERED

COURSES	SYNOPSIS
KAA502/4	<b>ATOMIC SPECTROSCOPY</b> This course discusses the fundamental principles, instrumentation, and their applications in qualitative and quantitative analyses involving various techniques of atomic spectroscopy.
KAA503/4	<b>MOLECULAR SPECTROSCOPY</b> This course deals with molecular spectroscopic techniques to elucidate molecular structures. Basic principles, instrumentations, techniques and applications of nuclear magnetic resonance, ultraviolet-visible and infrared spectroscopies and mass spectrometry are also discussed in terms of molecular structural determination.
KAA504/4	<b>ELECTROCHEMICAL METHODS</b> This course gives an overview of electrode processes, potential and current sweep and scanning methods. In addition, the applications of polarisation, electrochemical impedance, and other advanced electrochemical methods in research and industry are also discussed.
KAA505/4	<b>SEPARATION METHODS</b> This course discusses various methods and issues in sample preparation. Developments in recent separation methods such as gas chromatography, high performance liquid chromatography and capillary electrophoresis are also discussed.
KAA507/4	<b>SURFACE AND THERMAL ANALYSIS</b> This course discusses the techniques of thermal and surface analyses focusing on solid samples to assist scientists and engineers in selecting appropriate techniques to obtain the information on surface morphology, chemical composition, interplanar spacing, size and element distributions, porosity and surface adsorption properties. In thermal analysis, thermogravimetry, differential thermal analysis, differential scanning calorimetry, thermomechanical and dynamic mechanical techniques are also discussed.
KAA509/20	<b>DISSERTATION</b> Research projects on various chemistry topics.
KAA510/2	<b>QUALITY SYSTEMS AND INTELLECTUAL PROPERTY</b> The course covers quality systems emphasising on analytical laboratory management based on ISO which includes sampling system, equipment selection and consumables. Discussion focuses on types and sampling framework, preservation and storage of samples besides equipment selection, grade and handling of chemicals. It also includes intellectual property management and its role towards innovation and commercialisation.
KAA511/2	<b>RESEARCH METHODOLOGY</b> This course covers research proposal elaborating on key elements of research methodology like problem statement, objectives, philosophy and scientific method. Emphasis is also given on the important subjects in scientific writing starting from introduction to strategies of writing good quality proposal. Ethics and technical aspect in research and journal publication is also emphasised.

Upon completion of this programme, the students will be able to:

<b>PO1</b>	<b>Knowledge</b>	Demonstrate mastery of knowledge of chemical instrumentations.
<b>PO2</b>	<b>Practical Skills</b>	Apply practical skills and chemical instrumentations efficiently.
<b>PO3</b>	<b>Cognitiver Skills</b>	Demonstrate scientific and critical thinking in solving chemistry related problems.
<b>PO4</b>	<b>Communication Skills</b>	Demonstrate effective communication skills to convey information and knowledge in the field of chemistry.
<b>PO5</b>	<b>Interpersonal Skills</b>	Practise teamwork responsibly for public welfares.
<b>PO6</b>	<b>Ethics and Profesionalism</b>	Practise positive values, ethics and accountability in community and professional engagement.
<b>PO7</b>	<b>Personal Skills</b>	Integrate information and knowledge for lifelong learning.
<b>PO8</b>	<b>Entrepreneurial Skills</b>	-Not applicable in this programme.
<b>PO9</b>	<b>Leadership, Autonomy and Responsibility</b>	Demonstrate leadership abilities to foster strong collaboration.
<b>PO10</b>	<b>Digital Skills</b>	Demonstrate the ability to use digital technology and software for solving chemical problems.
<b>PO11</b>	<b>Numeracy Skills</b>	Apply numeracy skills to analyse and solve chemistry problems.

## **MASTER OF SCIENCE (CHEMISTRY) AND DOCTOR OF PHILOSOPHY (CHEMISTRY) – RESEARCH MODE**

The MSc. and PhD. programmes provide broad training opportunities across the chemical sciences. In-depth programmes of study are offered in the major chemistry disciplines (Organic, Physical, Inorganic, Industrial and Analytical Chemistry) such as those stated below:

### **Research Thrust Areas**

#### **Analytical Chemistry**

- Chemically Modified Electrodes
- Environmental Electrochemistry
- Environmental Photocatalysis
- Mechanochemistry
- Separation Chemistry
- Wastewater/Water Treatment

#### **Industrial Chemistry**

- Biopolymers and Modified Biopolymers
- Catalysis
- Corrosion Chemistry and Coatings
- Nanomaterials

#### **Inorganic Chemistry**

- Catalysis
- Coordination Chemistry
- Inorganic Polymers
- Inorganic Synthesis
- Liquid Crystals
- Organometallic Chemistry

#### **Organic Chemistry**

- Chemical Biology
- Liquid Crystals
- Natural Products Chemistry
- Organic Synthesis
- Polymer Chemistry

#### **Physical Chemistry**

- Catalysis
- Environmental Chemistry
- Nanomaterials
- Surface Chemistry



**Admission Requirements****MSc.**

- All applications for MSc. must possess a BSc. degree from a recognised university
- Must have an equivalent CGPA of 2.75 and above

**PhD.**

- Candidates for PhD. must possess a Master degree in a related area

**Language Requirement**

Results must be attached with the application form.

Applicable for international applicants only.

- A minimum score of 35 in Internet-based TOEFL (Test of English as a Foreign Language); **OR**
- A minimum of Band 5 in IELTS (International English Language Testing System); **OR**
- A minimum score of 154 in Cambridge English Advance (CAE); **OR**
- A minimum score of 154 in Cambridge Proficiency Advance (CPE); **OR**
- A minimum score of 36 in Pearson Test of English (PTE); **OR**
- A minimum of Band 2 in MUET (Malaysian University English Test)

Exemption can be given if:

- English is the candidate's mother tongue or national language; **OR**
- The candidate graduated from an Institution of Higher Learning in which the medium of instruction is English

**Duration:**

<b>MSc.</b>	<b>Full-time:</b>	<b>Part-time:</b>
	Minimum 2 semesters Maximum 6 semesters	Minimum 4 semesters Maximum 12 semesters
<b>PhD.</b>	<b>Full-time:</b>	<b>Part-time:</b>
	Minimum 4 semesters Maximum 10 semesters	Minimum 6 semesters Maximum 15 semesters

## Graduation Requirements

### MSc.

- i. Pass thesis examination
- ii. One (1) WoS/SCOPUS-indexed journals published or accepted
- iii. All foreign students are required to register & pass LKM111 Malaysian Culture and Malay Language with minimum grade C
- iv. Fulfill minimum period of candidature
- v. Give one (1) short presentation in School seminar before *viva voce* examination

### Fees\*:

Malaysian (MYR)	
Full-Time	Part-Time
<ul style="list-style-type: none"> <li>Registration Fee: 340.00</li> <li>Tuition Fee (Semester): 3,350.00</li> <li>Thesis Evaluation Fee: 750.00</li> <li>Convocation Fee: 200.00</li> </ul>	<ul style="list-style-type: none"> <li>Registration Fee: 340.00</li> <li>Tuition Fee (Semester): 2,775.00</li> <li>Thesis Evaluation Fee: 750.00</li> <li>Convocation Fee: 200.00</li> </ul>
International (USD)	
Full-Time	Part-Time
<ul style="list-style-type: none"> <li>Registration Fee: 227.50</li> <li>Personal Bond: 1,000.00</li> <li>Tuition Fee (Semester): 1,250.00</li> <li>Thesis Evaluation Fee: 250.00</li> <li>Convocation Fee: 50.00</li> </ul>	<ul style="list-style-type: none"> <li>Registration Fee: 227.50</li> <li>Personal Bond: 1,000.00</li> <li>Tuition Fee (Semester): 1,113.00</li> <li>Thesis Evaluation Fee: 250.00</li> <li>Convocation Fee: 50.00</li> </ul>

\*Fees are subject to change

**PhD.**

- i. Pass thesis examination
- ii. One (1) WoS-indexed Q1/Q2 journal published or accepted, or at least two (2) WoS/SCOPUS-indexed journals published or accepted
- iii. All foreign students are required to register & pass LKM111 Malaysian Culture and Malay Language with minimum grade C
- iv. Fulfill minimum period of candidature
- v. Give two (2) short presentations in School seminar before *viva voce* examination where one of the presentations preferably be presented in conference

**Fees\*:**

Malaysian (MYR)	
Full-Time	Part-Time
<ul style="list-style-type: none"> <li>Registration Fee: 340.00</li> <li>Tuition Fee (Semester): 3,350.00</li> <li>Thesis Evaluation Fee: 1,000.00</li> <li>Convocation Fee: 120.00</li> </ul>	<ul style="list-style-type: none"> <li>Registration Fee: 340.00</li> <li>Tuition Fee (Semester): 2,775.00</li> <li>Thesis Evaluation Fee: 1,000.00</li> <li>Convocation Fee: 120.00</li> </ul>
International (USD)	
Full-Time	Part-Time
<ul style="list-style-type: none"> <li>Registration Fees: 227.50</li> <li>Personal Bond: 1,000.00</li> <li>Tuition Fee (Semester): 1,250.00</li> <li>Thesis Evaluation Fee: 375.00</li> <li>Convocation Fee: 50.00</li> </ul>	<ul style="list-style-type: none"> <li>Registration Fee: 227.50</li> <li>Personal Bond: 1,000.00</li> <li>Tuition Fee (Semester): 1,113.00</li> <li>Thesis Evaluation Fee: 375.00</li> <li>Convocation Fee: 50.00</li> </ul>

\*Fees are subject to change



