INTRODUCTION
This programme is designed to equip professionals with a comprehensive knowledge in identification, management and control of process safety towards prevention of major accidents and losses in plant operation. This is inline with CIMAH regulations which require fundamental understanding of scientific knowledge and practices in chemical handling and plant operation. The programme will follow both semester system and modular approach. In a modular approach, each 3-credit course (a module) will be covered in an intensive one-week professional course to satisfy the 42 hours requirement of a semester. At the satisfactory completion of the module, students will be given a certificate of completion as well as the choice to accumulate the credits for the fulfillment of the master programme.

PROGRAMME REQUIREMENTS
Credit Requirements for Graduation
Students enrolling under this programme must fulfil 42 credits of course work to graduate. The credit distributions for compulsory courses, elective courses and dissertation are as follows:

<table>
<thead>
<tr>
<th>Course Category</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Compulsory Courses</td>
<td>6</td>
</tr>
<tr>
<td>Core Courses</td>
<td>20</td>
</tr>
<tr>
<td>Elective Courses</td>
<td>6</td>
</tr>
<tr>
<td>Dissertation</td>
<td>10</td>
</tr>
</tbody>
</table>

**Compulsory Courses**
Students must take both compulsory courses as below;

- ECH5514 Human Behaviour and Human Error 3 credits
- ECH5515 Research and Evaluation Method 3 credits

**Core Courses**
Students must take all the compulsory courses listed below;

- ECH5502 Hazard Analysis and Risk Assessment 3 credits
- ECH5503 Design for Safe Handling of Industrial Chemicals 3 credits
- ECH5504 Applied Hazard and Operability Studies 3 credits
- ECH5505 Process Reliability and Maintainability 3 credits
- ECH5506 Mechanical Failure and Electrical Hazards 3 credits
- ECH5510 Disaster Management and Emergency Plan 3 credits
- ECH5516 Process Safety Laboratory 2 credits

**Elective Course**
Students must take only two elective courses (6 credits) out of the listed below;

- ECH5101 Environmental Health Technology 3 credits
- ECH5501 Atmospheric Risk Management 3 credits
- ECH5511 Safety, Health and Environmental Protection 3 credits
- ECH5804 Corrosion Engineering 3 credits
- EAB5421 Forensic Science 3 credits
- EMM5201 Fire Safety Engineering and Regulations 3 credits

Identification on the elective courses for the student will be made by the program coordinator.

**Dissertation**
Student must take one project course which will be carried out in two consecutive semesters.

- ECH5990 Dissertation 10 credits
Course Synopsis

• ECH5514  • Human Behaviour and Human Error  • 3 credits
This course covers employee’s selection, placement and practice, psychological and ergonomical aspects, human factors in design systems and human reliability. Quantitative and qualitative assessment methods are used in risk assessment, risk management and communication.

• ECH5515  • Research and Evaluation Method  • 3 credits
The course covers the concepts, approaches and ethics in scientific research. Students are exposed to the methods and design of assessment instrumentation, data sampling, data collection and data analysis to produce technical report. Students will conduct a case study.

• ECH5502  • Hazard Analysis and Risk Assessment  • 3 credits
This course covers the interaction between process design and hazard identification. Safety enhancements of the plant at the design stage, hazard operability study and fault tree analysis techniques are emphasized. Risk assessment, including suitable criteria, is discussed. Information related to safety study is integrated within the design process.

• ECH5503  • Design for Safe Handling of Industrial Chemicals  • 3 credits
This course covers transport and thermodynamic properties of materials, handling of industrial chemicals, toxicity study, design of safety systems for laboratory, process plant and operation. Issues related to chemical waste disposal are also emphasized.

• ECH5504  • Applied Hazard and Operability Studies  • 3 credits
The course covers the use of HAZOP techniques in identifying any operational hazards in companies as well as formulation analysis on any occurrence and incident.

• ECH5505  • Process Reliability and Maintainability  • 3 credits
This course covers discussion on plant availability, plant reliability, event probability and failure frequency analysis. The focus of the course also includes layer of protection analysis and equipment maintainability.

• ECH5506  • Mechanical Failure and Electrical Hazards  • 3 credits
This course covers failures in mechanical design of process equipment. The topics covered include mechanical design failure, safety aspects in piping design, solid handling equipment and electrical hazards.

• ECH5510  • Disaster Management and Emergency Plan  • 3 credits
This course covers the management principles, planning and analysis of disaster and also emergency management for facing disaster and emergency situations in a more systematic and organized manner.

• ECH5516  • Process Safety Laboratory  • 2 credits
This course encompasses assisted laboratory works to perform hazard identification process, quantitative risk evaluation and probability analysis related to process safety and loss prevention.

• ECH5990  • Dissertation  • 10 credits
The student will carry out a detailed study to evaluate the significant method and develop a research project related under a supervision of a lecturer. Students will perform the study according to a suitable methodology for the project that will be implemented. A proposal report need to be prepared at the beginning of the study. At the end of the project, the student will submit a complete project for evaluation. The student will also be required to present the project in a seminar organized by the department.

• ECH5101  • Environmental Health Technology  • 3 credits
This course covers planning on public health measures and preparedness against emerging environmental, health and safety related issues. Effects of water and air pollutions are related to infectious diseases. Health problems from various sources, disposal and management of solid, toxic and hazardous wastes are identified. The effects to human health, environment and economy are evaluated.

• EAB5421  • Forensic Science  • 3 credits
This course covers investigation of disasters, industrial accidents, and risks of fire by analyzing physical evidences using forensic technique and witnesses’ interviews.

• ECH5501  • Atmospheric Risk Management  • 3 credits
This course covers relationships between atmospheric risk characteristics with the sources and air risk effects. Explanation on the importance of air pollution policies and laws are implemented. Atmospheric toxic with the indoor air quality concept are related. Appropriate risk management techniques are developed.

• ECH5511  • Health, Safety and Environmental Protection  • 3 credits
This course covers assessment on the risks to health, safety and environment and prevention techniques. Regulations and standards relating to health, safety and the environment are identified. Determination of prevention level and utilization of appropriate personal protective equipment are implemented. Health, safety and environmental audit in the workplace are developd.

• ECH5804  • Corrosion Engineering  • 3 credits
This course covers measurement on rate and types of corrosion with testing methods. The applicability of the metal or alloy in the environment is described. Material selection and appropriate environment for corrosion control are implemented. Suitability of control methods and corrosion prevention are assessed.
ADMISSION REQUIREMENTS

The minimum requirement to enrol in this program are as follow:

a) Bachelor in the field of Engineering or Engineering Technology with a CGPA of 2.750/ Second Class Lower; or
b) Bachelor in the field of Engineering or Engineering Technology with a CGPA of 2.500/Second Class Lower with at least three (3) years of working experience in the field of study that is being applied for; or

c) Bachelor in any related field of Science or Technology with a CGPA of 3.000/Second Class Upper; or

d) Bachelor in any related field of Science or Technology with a CGPA of 2.750/ Second Class Lower with at least three (3) years of working experience in the field of study that is being applied for; or

e) A qualification equivalent to a Bachelor's degree recognized by the professional bodies and MQA

Note:
* When candidates with Bachelor of Science or Technology degrees or their equivalents are admitted, prerequisite modules in Engineering, i.e Remedial Course must be offered to adequately prepare them for their advanced study

FEES

<table>
<thead>
<tr>
<th>Fees</th>
<th>Master without thesis</th>
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<tbody>
<tr>
<td></td>
<td>Malaysian Student</td>
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<tr>
<td>Basic Fees (1st semester)</td>
<td>RM1250</td>
</tr>
<tr>
<td>Basic Fees (2nd and subsequent semester)</td>
<td>RM1000</td>
</tr>
<tr>
<td>Credit Fees</td>
<td>RM250/Credit Hour</td>
</tr>
</tbody>
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Language Requirement

- A Malaysian candidate must have obtained at least a credit in English at Sijil Pelajaran Malaysia level or have passed English courses conducted at the Diploma or Bachelor’s Level.
- All international candidates from countries where English is not a medium of instruction must have obtained a minimum score of 550 for TOEFL Paper-based Test (Academic Version); or Band 6.0 for IELTS (Academic Training); or 79-80 for TOEFL Internet-based Test (Academic Version).
- A candidate without the requisite minimum score for TOEFL or IELTS may be granted a provisional admission. Such candidate will be required to pass an English Placement Test conducted by the University.
- A candidate who has failed the English Placement Test will be required in the first semester to pass a prescribed English course. Should the candidate fail to obtain the prescribed minimum grade, the University may allow him to repeat the prescribed English course in the second semester.
- A candidate who fails after the second attempt will have his candidature suspended until he passes the English course before being allowed to continue with his Masters programme.

Application For Admission

Please apply online via http://sgsportal.upm.edu.my:8080/sgsportal/
Tel. : (603) 9769 4218/4223/4228
Website : http://www.sgs.upm.edu.my/prospective_students-2964