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KABIR, Feroz <<http://orcid.org/0000-0002-3121-9086>>

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## Assessment of Module Learning Outcomes for H84ARE Advanced Reaction Engineering for Continual Quality Improvement

Feroz Kabir

Department of Chemical and Environmental Engineering, Faculty of Engineering, The University of Nottingham,  
Jalan Broga, 43500, Semenyih, Selangor

Corresponding Author's E-mail: [Feroz.Kabir@nottingham.edu.my](mailto:Feroz.Kabir@nottingham.edu.my)

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### Introduction

Advanced Reaction Engineering Introductory with module code of H84ARE is a level 4 module offered in Spring semester. All the modules in year 4 are optional under depth category. The module is 10 credits. Students' performance on this module is determined by the following assessment type:

- Examination 1 (80%)
- Coursework-1, Random quizzes (10%)
- Coursework-2 (10%)

The module learning outcomes (MLO) of H84ARE are as follows:

MLO1: Solve chemical reaction engineering problem through logic

MLO2: Developing and solving design equations for flow reactors

MLO3: Identification and quantification of non-ideal behavior of real reactors

MLO4: Modeling real reactor as a combination of ideal reactor and predict conversions; study of heterogeneous catalytic reaction systems

MLO5: Analyze and model solid-fluid, and fluid-fluid reaction systems

The Exam 1 paper consists of 6 questions in 2 sections. Each section has 3 questions and must answer 2 out of 3 questions. Coursework-1 is a random quizz carries 10% marks, and coursework-2 is a project based activity dealing with defining thystem, model development, assumptions, setting boundery conditions and solution methodology All questions set in the different assessment types are compulsory so that all students are tested on similar set of assessments. Therefore, the learning outcomes attainment for all students is the same. The quizzes are intended to keep students on continuous and deep learning mode.

The MLO-PO mapping matrix is shown in Table 1.

Table 1: MLO-PO matrix for H81ETD

	US1m	E2m
MLO1	√	√
MLO2	√	√
MLO3	√	
MLO4	√	√
MLO5	√	

### Performance Indicator

The performance indicator is summarised in Table 2. Generally, the performance indicator set for this module is at various levels of measurement, namely student passing an individual MLO, student passing a module in terms of MLO attainment, passing of an individual MLO and finally passing of a module.

Table 2: Performance indicator at various levels of measurement

Various level of measurement	Performance indicator
Student considered passing an individual MLO	Individual MLO attainment more than 40%
Student considered passing the module	Not failing more than 1 MLO
Each LO considered pass	Less than 30% of students fail the LO attainment
The module considered pass	Less than 20% of students fail more than 1 MLO

### Method of Assessment

Contribution of each assessment method employed in this analysis is shown in Table 3. The contribution of the respective assessment components to the attainment of the five MLOs are also indicated in the table.

Table 3: Type of assessment and its percentage distribution with reference to MLOs

Type of Assessment		Assessment component		% distribution					
Assessment	Weightage	Component	Weightage	LO1	LO2	LO3	LO4	LO5	LO6
Exam 1	80								
Coursework-1	10		100						
Coursework-2 (random quizzes)	10		100						

### Results of the Assessment

A total of 36 students were assessed in this module. Analysis shows that 34 students performed above the module performance indicator which states not failing more than 1 MLO. This in turn indicates that 5.6% of students failed the module in term of MLO attainment. With reference to the performance indicator for the entire module attainment, it is above the performance indicator.

With reference to the attainment of the individual MLO, 5.6% students failed MLO3, MLO4 and MLO5, and none failed MLO1 and MLO2. This indicates all MLOs attainment is above the performance indicator. The attainment of MLO3, MLO4 and MLO5 is comparatively low, thus more tutorial time will be given in the next academic year.

### Conclusion

Mapping of the LO and PO of H84ARE has been completed. There were 3 types of assessments: final exam (80% marks), courseworks (project and random quizzes,

10%marks for each types of assessment). The analysis shows that only 5.6% of students failed the overall MLO attainment. This in turn indicates that the overall module MLO attainment is above the performance indicator. However, more tutorial time gill be given to the students in the next academic year.

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