City University of Hong Kong

Information on a Course
offered by Department of Mechanical and Biomedical Engineering
with effect from Semester A in 2013/2014

Part I

Course Title: **Advanced Nuclear Reactor Engineering**

Course Code: **MBE5105**

Course Duration: **One Semester**

No. of Credit Units: **3**

Level: **P5**

Medium of Instruction: **English**

Prerequisites: **Nil**

Precursors: **MBE3107 Principles of Fission Reactors or equivalent**

Equivalent Courses: **Nil**

Exclusive Courses: **MBE4108 Nuclear Reactor Engineering or equivalent**

Note:
Students may repeat a course, or an equivalent course, to improve course grade only if the previous course grade obtained is C or below.

Part II

1. Course Aims

This course aims to introduce the principles of thermal-hydraulic analysis of nuclear power systems, with special emphasis towards the analysis of nuclear power reactors.

2. Course Intended Learning Outcomes (CILOs)

Upon successful completion of this course, students should be able to:

No.	CILOs	Weighting* (if applicable)
1.	**Explain** the principles of thermal-hydraulic analysis of nuclear power systems.	2
2.	**Develop** the conservation equations of mass, motion and energy in a generalized form.	2
3.	**Apply** the appropriate equations to specific phenomena arising in the design of nuclear systems.	2
4.	**Discuss** the reactor transient response.	2
5.	**Describe** dynamic characteristics of a reactor and the effect of Xenon	1

***Weighting ranging from 1,2,3 to indicate the relative level of importance in an ascending order.**

3. Teaching and Learning Activities (TLAs)

(Indicative of likely activities and tasks designed to facilitate students' achievement of the CILOs. Final details will be provided to students in their first week of attendance in this course)

Activity Type	Timetabled Activity (Hours per week)
Lecture/Tutorial/Laboratory Mix	Lecture (3)

TLAs	Large Class Activities	Self-study Activities	Hours/week (if applicable)
CILO 1	9	(9)	9(+9) = 18
CILO 2	9	(9)	9(+9) = 18
CILO 3	9	(9)	9(+9) = 18
CILO 4	9	(9)	9(+9) = 18
CILO 5	3	(3)	3(+3) = 6
Total (hrs)	**39**	**39**	**39(+39) = 78**

4. Assessment Tasks/Activities

(Indicative of likely activities and tasks designed to assess how well the students achieve the CILOs. Final details will be provided to students in their first week of attendance in this course)

ATs	Examination (2 hrs)	Homework	Total (%)
CILO 1	18	5	23
CILO 2	18	5	23
CILO 3	18	5	23
CILO 4	18	5	23
CILO 5	6	2	8
Total (%)	**78**	**22**	**100**

For a student to pass the course, at least 30% of the maximum mark for the examination should be obtained.

5. Grading of Student Achievement:

Grade Table

Letter Grade	Grade Point	Grade Definitions
A+ A A-	4.3 4.0 3.7	Excellent
B+ B B-	3.3 3.0 2.7	Good
C+ C C-	2.3 2.0 1.7	Adequate
D	1.0	Marginal
F	0.0	Failure
P	-	Pass

Please refer the SGS's website for details.

Part III

Keyword Syllabus

- Fluid dynamics and heat transfer.
- Thermal and hydraulic analysis of nuclear reactors.
- Fluid systems analysis, two-phase flow and boiling.
- Energy conversion methods.
- Heat generation in nuclear reactors.
- Thermal hydraulic design of reactor cores and plant components
- Reactor Kinetics
- Dynamic Characteristics of a Reactor
- Effect of Xenon
- Advanced reactor designs

Recommended Reading:

Text(s)

J.H. Rust, Nuclear Power Plant Engineering, Haralson Publishing Company, ISBN-10: 0934534004

Lamarsh J R and Baratta A J, Introduction to Nuclear Engineering, Prentice Hall, ISBN: 0-201-82498-1

Versteeg HK and Malalasekera W, An introduction to Computational Fluid Dynamics, the Finite Volume Method, Pearson-Prentice Hall, ISBN: 978-0-13-127498-3