NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

COURSE CONTENT

Academic Year	2022/2023	**Semester**	2
Course Coordinator	Assoc. Prof. Lau Wai Man Raymond		
Course Code	CH4245		
Course Title	Case studies for Chemical and Biomedical Engineers		
Pre-requisites	NIL		
No of AUs	3		
Contact Hours	39 tutorial hours		
Proposal Date	23 Jul 2017		

Course Aims

The objective of this course is to provide exposures to real life industry problems that are encountered in chemical, pharmaceutical, healthcare and other industry sectors. You will be interacting with engineers from industries and work in groups to tackle the problems as case studies.

Intended Learning Outcomes (ILO)

Student will be able to:

1. Identify the basic tools used for problem solving.
2. critically analyze and examine problems of different nature.
3. Apply basic concepts of root cause analysis in problem solving.
4. write technical report and present technical findings.

Course Content

Key topics include:

1. Root cause analysis
2. Chemical industry
3. Pharmaceutical industry
4. Semiconductor industry

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/ Individual	Assessment rubrics
1. Continuous Assessment 1 (Quiz)	1, 2, 3, 4	EAB SLO* a, b, c, d, i, j	10%	Individual	No assessment rubric for this component
2. Continuous Assessment 2: Report/Presentation on case study 1	1, 2, 3, 4	EAB SLO* a, b, c, d, i, j	30%	Team	See Appendix 1
3. Continuous Assessment 3: Report/Presentation on case study 2	1, 2, 3, 4	EAB SLO* a, b, c, d, i, j	30%	Team	See Appendix 1
4. Continuous Assessment 4: Report/Presentation on case study 3	1, 2, 3, 4	EAB SLO* a, b, c, d, i, j	30%	Team	See Appendix 1
Total			100%		

Formative feedback

At the end of the presentation sessions, feedbacks will be provided. Common mistakes and misunderstanding will also be addressed.
Specific feedback to project work will be returned to students in writing. General feedback to project work will be published online.

Learning and Teaching approach

Approach	How does this approach support students in achieving the learning outcomes?
Team based discussion	Sessions involving sharing and interactions with industry engineers, visit to plant sites, and presentation of findings. Students are to demonstrate the knowledge acquired by written reports and oral presentations.

Reading and References

1. Duke Okes, Root Cause Analysis – The Core of Problem Solving and Corrective Action, American Society for Quality, 2009.

Course Policies and Student Responsibilities

You are responsible for meeting all course requirements, observing all deadlines, examination times, and other course procedures.

You will be awarded ZERO mark for being absence from quizzes unless it is due to the following reasons:

- Illness (valid medical certificate is required, private TCM doctor not registered under Medical Registration Act will not be acceptable)
- Passing away of immediate family member (parents, siblings or grandparents)
- Participate in an activity representing NTU (support letter from participating organization)

You are responsible for following the university regulations for final examination as indicated here:
http://www.ntu.edu.sg/Students/Undergraduate/AcademicServices/Examination/Pages/Instructionstoexamcand.aspx

You are responsible for being on time for classes. Sufficient efforts should be put into solving or attempting the questions raised.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty.

You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors

Instructor	Office Location	Phone	Email
Lau Wai Man	N1.2-B2-32	63168830	wmlau@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Introduction to Root Cause Analysis	1, 2, 3	
2	Introduction of Case Study Problem 1	1, 2, 3	
3	Interaction with Industry Partners/visit to plant site	1, 2, 3	
4	Formulation of solutions	1, 2, 3, 4	
5	Presentation 1	4	
6	Introduction of Case Study Problem 2	1, 2, 3	
7	Interaction with Industry Partners/visit to plant site	1, 2, 3	
8	Formulation of solutions	1, 2, 3, 4	
9	Presentation 2	4	
10	Introduction of Case Study Problem 3	1, 2, 3	
11	Interaction with Industry Partners/visit to plant site	1, 2, 3	
12	Formulation of solutions	1, 2, 3, 4	
13	Presentation 3	4	

Appendix 1: Case Study Project

Criteria	Exceed Expectations	Meet Expectations	Meet Baseline Expectations	Below Expectations
LO 1, 2, 3, 4	Demonstrates very deep interest and a wider understanding of root cause analysis and applications in a certain industry The results were interpreted clearly and conclusion drawn was supported by strong evidence. Reports and presentations are concise, coherent, well-organized and well-structured. The format is consistent throughout.	Demonstrates reasonable interest and understanding of root cause analysis and applications in a certain industry. The results were interpreted correctly but the conclusion was not fully supported by evidence. Reports and presentations are coherent and organized. The format is consistent throughout.	Demonstrates shallow interest and understanding of root cause analysis and applications in a certain industry. The result interpretation was acceptable but the conclusion was not supported by clear evidence. Reports and presentations are organized but the format is inconsistent.	Shows no interest and understanding of root cause analysis and applications in a certain industry. No result and/or interpretation to showcase. Reports and presentations are unorganized and difficult to comprehend.

Appendix 2: The EAB (Engineering Accreditation Board) Accreditation SLOs (Student Learning Outcomes)

a) **Engineering Knowledge:** Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems

b) **Problem Analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c) **Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

d) **Investigation:** Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e) **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

f) **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g) **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.

h) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i) **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

j) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

k) **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l) **Life-long Learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change