UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Teaching Portfolio

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1. Teaching Responsibilities

My name is Mohsin bin Mohd Sies and I have a mixed engineering background. I was accepted as a lecturer in the Faculty of Mechanical Engineering, UTM with a Bachelor's Degree in Nuclear Engineering. As a lecturer in Mechanical Engineering, I pursued my Master's Degree in Mechanical Engineering. However, with the new Nuclear Engineering Program offered at UTM, I enthusiastically accepted the offer to be a lecturer in this new program.

It has always been my dream and pleasure to be able to teach and impart understanding to students. Sharing my knowledge and experience and seeing the spark of understanding and inspiration in my students' eyes are the most satisfying feelings I get during the more than twenty years of teaching in UTM.

a) Courses taught:

The courses that I have taught have been quite varied in terms of level, scope and subject matter. My field of knowledge is Thermodynamics, Heat Transfer, Energy and Combustion and the courses that I have taught reflect that. I regularly teach Thermodynamics, Applied Thermodynamics and the Thermodynamics Labs. I also teach advanced and elective courses such as Combustion Processes, Heat Transfer, and Internal Combustion Engines.

However, I also enjoyed teaching foundational general engineering classes such as Programming for Engineers, Applied Numerical Methods for Engineers and Experimental Methods.

Starting in 2004, I have also been given responsibilities to not just teach, but to also design new syllabi for Postgraduate courses. These include Computational Methods for Engineers, Advanced Thermodynamics and also Advanced Combustion.

Since transferring to the Nuclear Engineering Program in 2015, I have started to teach Transport Processes and Nuclear Engineering Systems and Design II. I am excited to start teaching a new course in Reactor Thermal Hydraulics soon.

In the last few years, I have taught Postgraduate courses; Advanced Thermodynamics (MKMM 1413) and Computational Methods for Engineers (MMJ 1113). I also taught the final year elective subject Combustion Processes (SME 4483). In the Nuclear Engineering Program, I teach Nuclear Engineering Systems and Design II (SKPN 4834) and Transport Processes (SKPN 3133). I also regularly taught Applied Numerical Methods for Engineers (SME 3023), Applied Thermodynamics (SKMM 2423) and Thermodynamics (SKMM 1413).

For all my courses, I maintain a very actively updated webpage at http://www.fkm.utm.my/~mohsin from which students can obtain information, announcements, and access notes, assignments and marks.

My portfolio focuses on the two courses I have taught: SME 3023 and SME4483.
I had been given an opportunity to design an elective course on combustion titled Combustion Processes (SME 4483), now superseded by SKMM 4453 (Combustion Processes). The course focuses on the basic concept of combustion and its applications in various fields such as boilers, detonation and safety, and pollutant control. In this course, I combined theoretical analysis and simulation besides case study on specific topics. For example, I used the open-source NASA code CEA for combustion analysis, which students need to simulate the case study given. Report and

presentation were assessed with constructive discussion on the results presented. Since this subject is my passion, I can see the same passion sparked in the eyes of my students in the way they enthusiastically ask interesting questions not covered in class material and how some of them approached me to inquire about research and final year project opportunities with me.

Sample of Course outline for SME 4483 (and the updated SKMM 4453) are attached in Appendix 1.

b. Research-Related Teaching

I greatly enjoy meeting students privately in my office to discuss technical issues and also research matters. From my research projects, I find opportunities to supervise students on their final year projects and also some graduate students for their Masters project. With every major project, students are required to produce a publishable paper. This exercise builds their skill in writing and presenting their ideas academically. I also assign paper reviews for my students as part of their class assignments. The review would not just be point summaries but to find weaknesses and poke holes in the journal paper. This builds their critical thinking skills.

Weekly meetings are held for such projects, sometimes one-on-one, and sometimes in a group. This is to get the students to jointly think, criticize and give ideas on how to improve each other's projects. I also give ideas for research paper titles that can be produced and let the students develop it further on their own. This would then be discussed together until a satisfactory result is produced.

c. Teaching Communication

I believe one of the most important skills towards good thinking is a very strong grasp of grammar and language. Sloppy language results in sloppy thinking. Precise understanding of words and language is essential for clear and logical thinking. This also translates into good writing and speaking skills. I emphasize such on my students and demand that they speak in full sentences articulating their thoughts and write grammatically correct sentences in their reports. If necessary, I would even interview students to get a clear picture of their understanding of the subject matter.

2. Teaching philosophy

I believe the gaining of knowledge needs both a good teacher and an interested student. I believe learning is not limited to classroom and period. As Mark Twain said, "Don't let school get in the way of your education". Gaining of knowledge occurs at all times and places provided the brain and soul are already sparked towards learning something of interest. It is not just the responsibility of the teacher to spark this interest, but the student has to be inclined towards such. For this to happen, the larger society, environment and culture have to be encouraging the pursuit of all kinds of knowledge, not just for its utility towards monetary gains, but also knowledge for its own sake and enjoyment. I believe this is one of the main reasons why nowadays good students in Malaysia are less interested to pursue STEM education and opting for Finance and related fields instead.

The outcome of a course that I say at the beginning of each semester is that "I want you to be able to argue with me" because I feel that encompasses all the good outcomes that a student should achieve. I value a good discussion with my students and I don't mind digressing from the subject

matter at hand to discuss an interesting issue with students. I encourage my students to question me, not to believe everything I say blindly, and work out the issue on their own before arriving at the same conclusions I had. A good class period is when I have a good two way argument with my students where I can see the knowledge and thinking building in their brains as we argue an issue out. For this I don't give a straightforward answer to their questions in class. I tease their brains to get them to think for themselves and build up from whatever basic knowledge that they already had to arrive at the answer to their own questions.

Even though I am open in class, I am also strict with discipline. I always emphasize punctuality, academic honesty and fairness. I believe knowledge and education cannot be achieved without discipline, and this is the responsibility of a student himself. For this I always remind my students at the beginning of each semester that I treat them like adults, meaning that they take responsibility of their own discipline and there will be fairness in my treatment to all of them and whatever grade that they get at the end of the semester will be the grades deserved and fairly earned.

I embrace new approaches to learning such as student centered learning and problem based education as these are excellent ways to enhance the learning experience. I always try to find ways to get students to become actively involved in learning. The more actively involved and the more varied the involvement is, the better a student will learn. However, I believe there is a balance that we need to find with the traditional "chalk and talk" method because there are things that just require to be guided handheld and told to understand.

Finally, I also try to instill humility because vast knowledge without humility is a recipe towards destruction of self and environment. I am not afraid to say that I don't know if they have a seriously difficult question, and I remind them not to be afraid to recognize the limits of their knowledge. However, at the beginning of each semester, I also say that one of my goals is for my students to grow and become better than me. This is to emphasize that learning is not limited to a teacher, and new knowledge is still out there to be discovered, and they should have the honor of discovering it to benefit humanity.

3. Teaching Methodology

I use a combined approach of traditional lecturing with modern techniques such as active and problem based learning. I believe both approaches have a place in modern class settings. At times, we need active and problem based learning for self-discovery of knowledge with better retention. However, there are also times when we need single track focus to learn something such as mathematical derivations. Students are required to do preliminary reading and self-learning before coming to class so that cooperative and active learning activities produces fruitful results. Any unclear issue will be discussed in class by building up from any little knowledge that they have on the subject and also by drawing from their general knowledge. Whenever suitable, messy real life problems will be posed to my students for them to wrestle with. In the process, I help them in clarifying the issue and guide them towards discovering and reinforcing the knowledge that they have learned in class. Practical demonstrations are also done to give students clear picture of how things are in reality. For example, students are shown the detonation phenomenon in the lab as part of SME 4483 Combustion Processes course. This emphasizes how fast, loud and powerful a detonation is, which can't be conveyed in books. Quizzes are regularly given to make sure students are up to date with basic terms, formulas and concepts. Discussions and projects cover the whole range of taxonomy levels where students have to not only synthesize concepts,

but to also look back at what they have learned and evaluate and note the weaknesses and limitations.

4. Teaching evaluation

Students' response to my teaching varies from semester to semester and also within the same class. Some students responded well to my approach while some didn't. It is challenging to find the right balance to reach all students equally. Some semesters I received good evaluation while some others I did not. Some samples of my eppp scores are given in the table below. I try to find specific comments and suggestions in my students' feedbacks to improve my teaching. Some of their comments and criticisms are listed below.

'thank you sir..i become interest with thermodynamics because i like the way u taught us..'

'dedicated and fully motivated in teaching. '

'nota yang mudah difahami. halalkan ilmu yang diberikan. terime kasih encik '

'among my fav lecture especially the way how Dr Mohsin deliver his lecture very inspiring'

'A very good lecture who is capable to make every student understand and enhance their logical thinking.'

'The lecturer can teach very well. I hope that the lecturer can teach the subject in order so that the student can understand clearly. Thank you.'

'The lecturer conducts the class well.'

Sample eppp score for subjects

Semester	2016/17-2	2014/15-2	2012/13-2
SKMU2113	4.65	-	-
SKMM2423	-	4.42	
SME4463	-	-	4.62

I also solicit comments and evaluations from my students in the middle of the semester to see how well they respond to my teaching and where I should modify my approaches for the rest of the semester. I respond to their comments in class and tell them where I agree with their suggestions and where I disagree and explain why.

5. Course improvement activity

To keep teaching effectively, I keep up to date with the latest advances in my field and keep informed in the latest approaches to effective teaching. For this, I regularly attend conferences, read journal papers, conduct research, and I maintain a broad reading of current events and relate them to my subjects. This helps in putting theoretical knowledge covered in class in its proper context in the real world.

Keeping good personal contacts with friends in the industry also helps to keep my lectures relevant in the real world. Informal discussions and during private meetings with them helps me learn from their practical experiences and expand my horizons and I put them to effective use in class.

I also attended several courses and teaching workshops conducted by CTL and UTMLead. These include Course on Adult Learning, Teaching Portfolio Workshop, Workshop on the UTM E-Learning System, UTM OpenCourseWare Workshop where I produced some open courseware

materials, and also Course on OBE by PM Yahya Samian. I try to incorporate what I have learned from these courses into my teaching to further improve its effectiveness.

6. Product of teaching

From my teaching activities over the years, I have made my knowledge available and accessible to anyone by publishing my notes on my website at http://www.fkm.utm.my/~mohsin which is rather highly indexed by Google. I also promote open source solutions and alternatives to my students for simulations and computations such as the CEA chemical equilibrium package for combustion analysis, Octave numerical analysis package, OpenFOAM package for CFD problems, and Salome-Meca for geometrical modelling and meshing. I have also jointly published papers on engineering education to share my experiences and also published a book on Thermodynamics.

7. Short and long term goals

My short term goals are to continuously improve my teaching skills by adopting the latest techniques and ideas for effective teaching such as problem based learning and active learning. For this, I will attend more courses towards this purpose and get help from fellow lecturers for ideas and tips to be a more effective teacher. Tools such as social media, e-learning sites and multimedia will be more integrated with my teaching. I will also keep my notes and website always updated.

My long term goal is to see my students soar on their own and be better than me while not forgetting me and the strong fundamentals that I have given them. If my students keep on learning for life, use their knowledge beneficially, expand the knowledge for the benefit of all and be a better human overall, I would consider my long term goals accomplished.

Appendix I

Course Information for Combustion Processes (SME 4483)

FAKULTI KEJURUTERAAN MEKANIKAL
UNIVERSITI TEKNOLOGI MALAYSIA
SEMESTER JULY 2009/2010

COURSE INFORMATION

CODE	**:**	**SME 4483**
COURSE NAME	**:**	**COMBUSTION PROCESSES**
CONTACT HOURS	**:**	**42 HRS (14 WEEKS)**
CREDIT	**:**	**3**

WEEK	Date	Topics	Test
1		**1. Introduction** 1.1. Types of Flames; Processes in Combustion 1.2. Bunsen Burner, Candle Flame	
2 3 4		**2. Thermodynamics of Combustion Processes** 2.1. First Law; Standard Enthalpies of Formation 2.2. Adiabatic Flame Temperature 2.3. Chemical Equation Balancing, Stoichiometry, Air Fuel Ratio 2.4. Equilibrium Constants	
5		**3. Fuels** 3.1. Types and Classifications of Fuels	
6 7		**4. Chemical Kinetics** 4.1. Reaction Rates (Forward and Backward), Activation Energy, Arrhenius Rate 4.2. Temperature and Pressure Dependence of Rate Coefficients 4.3. Chain Reactions: Chain Branching, Chain Quenching	
8		**MID-SEMESTER BREAK**	
9 10		**5. Premixed Combustion** 5.1. Laminar Flame Speed 5.2. Stability Limits of Laminar Flames 5.3. Turbulent Flames; Turbulent Flame Speed 5.4. Quenching and Stabilization	
11 12		**6. Non-Premixed Combustion (Diffusion Flames)** 6.1. Gaseous Fuel Jets 6.2. Burke Schumann Flame 6.3. Single Fuel Droplet Burning, Sprays 6.4. Opposed Jet Flame	
13 14		**7. Detonations** 7.1. Explosion, Deflagration, Detonations 7.2. Hugoniot Curve, Chapman-Jouguet Point 7.3. Detonation Velocity	
15		**8. Pollutant Formation**	

16		8.1. Formation of Nitric Oxides 8.2. Carbon Monoxide 8.3. Unburnt Hydrocarbons 8.4. Soot Formation	
17		**STUDY WEEK**	
18		**FINALS**	

EVALUATION

Test 1 (Open book/notes) *25 %*
Test 2 (Open book/notes) 25 %
Homework 10 %
Project 1 /Term Paper 20 %
Project 2 20 %
Total **100 %**

TEXT

An Introduction to Combustion, *Stephen R Turns*, McGraw Hill

REFERENCES

Principles of Combustion, *Kenneth K Kuo*, J Wiley
Combustion Engineering, *Borman, Ragland*, McGraw-Hill
Combustion, *Irvin H Glassman,* Academic Press

LECTURERS

Lecturer	Section	Room	Ext.	Email
Dr Mazlan Abd Wahid		C24-309	34574	mazlan@fkm.utm.my
Mohsin Mohd Sies		C24-313	34578	mohsin@fkm.utm.my

Course Information (updated) Combustion Processes (SKMM 4453)

PRE-REQUISITE	**:**	**SKMM2413 & SKMM2423**
EQUIVALENCE	**:**	**-**
LECTURE HOURS	**:**	**42 hours (14 weeks)**

Lecturers	E-Mail	Website	Room No.	Phone No.
1. Assoc Prof. Dr. Mazlan Abdul Wahid	mazlan@fkm.utm.my	http://www.fkm.utm.my/~mazlan	C24–333	553457
2. Dr. Aminuddin Saat	amins@fkm.utm.my	http://www.fkm.utm.my/~amins	C23-216	553457

SYNOPSIS

Students will be exposed to the concepts and the basic combustion processes. Various aspects of combustion such

as the thermodynamics of combustion, the chemical kinetics, transport phenomena, Rankine-Hugoniot theory, Chapman-Jouguet waves, deflagration, detonation, diffusion flames, premixed flames, flammability, ignition and quenching will be discussed. Chemical processes that lead to various emissions and pollutant formation as well as strategies for mitigation the pollutants produced from combustion process will be stressed at later part of this course. Students will also explore various practical aspects of combustion processes.

PREPARED BY :		**CERTIFIED BY :**	
Name	: Assoc. Prof. Dr. Mazlan Abdul Wahid	**Name**	: Head of Department
Signature	:	**Signature**	:
Date	:	**Date**	:

COURSE LEARNING OUTCOMES

By the end of the course, students should be able to :

No.	Course Learning Outcomes	Programme Outcome(s) Assessed	Bloom Taxonomy	Assessment Methods
1.	**Identify** the basic concept of combustion ands its applications	PO1	C2	T, HW, PR
2.	**Apply** the thermodynamics of combustion theory in different type of fuel-air mixture conditions	PO1,PO2	C4	T, HW
3.	**Analyze** theoretically different type of combustion process	PO1,PO2	C4	T, HW
4.	**Describe** the chemical processes that lead to various emissions and pollutant formation as well as strategies for mitigation.	PO1	C2	T, HW
5.	**Prepare** written project report on the topics of combustion and related issues	PO1,PO11	C3, P3	PR

Note :
(T – Test ; PR – Project ; HW – Homework)

STUDENT LEARNING TIME

No.	Teaching and Learning Activities	Student Learning Time (hours)
1.	Lecture	42
2.	Independent Study - self learning - information search - library search - reading	40
3.	Homeworks - self learning - group discussion	8
4.	Project - information search - library search - group discussion - report writing	20
5.	Tests and preparation for the test	10
Total		**120**

TEACHING METHODOLOGY

1. Explain to students the fundamental theory and formulations related to each chapter.
2. Demonstrate solution to problem examples related to the various subtopics contained in each chapter.
3. Do class exercises where students are asked to solve problems from subtopics in each chapter. Students are encouraged to discuss with their peers during this session.

WEEKLY SCHEDULE

Week	Topic / Content
1	**Introduction** Types of Flames; Processes in Combustion Bunsen Burner, Candle Flame
2 - 3	**Thermodynamics of Combustion Processes** First Law; Standard Enthalpies of Formation Adiabatic Flame Temperature Chemical Equation Balancing, Stoichiometry, Air Fuel Ratio

	Equilibrium Constants
4 - 5	**Chemical Kinetics and Fuels** Reaction Rates (Forward and Backward), Activation Energy, Arrhenius Rate Temperature and Pressure Dependence of Rate Coefficients Chain Reactions: Chain Branching, Chain Quenching Fuel use in Combustion
6 - 7	Combustion Calculation using Softwares
8	**MID SEMESTER BREAK**
9 - 10	**Premixed Combustion** Laminar Flame Speed Stability Limits of Laminar Flames Turbulent Flames; Turbulent Flame Speed Quenching and Stabilization
11 - 12	**Non-Premixed Combustion (Diffusion Flames)** Gaseous Fuel Jets Burke Schumann Flame Single Fuel Droplet Burning, Sprays Opposed Jet Flame
13 - 14	**Detonations** Explosion, Deflagration, Detonations Hugoniot Curve, Chapman-Jouguet Point Detonation Velocity
15	**Combustion Emissions** Formation of Nitric Oxides Carbon Monoxide Unburnt Hydrocarbons Soot Formation

REQUIRED TEXT:

- Turns, Stephen, R., An Introduction to Combustion: Concepts and Applications, 2nd Edition. McGraw-Hill, © 2000.

ADDITIONAL TEXTS:

- Borman, Gary, L., and Ragland, Kenneth W., Combustion Engineering. McGraw-Hill, © 1998.
- Glassman, I., Combustion, 3rd Edition, Academic Press © 1996, 1987, 1977.
- Kuo, Kenneth, K., Principles of Combustion, 2nd Edition. John Wiley & Sons, Inc., © 2005.
- Schmidt, Lanny, D. The Engineering of Chemical Reactions, 2nd Edition. Oxford University Press, © 1998, 2005.

GRADING

No.	Assessment	Number	% Each	% Total
1.	Test 1	1	20	20
2.	Test 2	1	20	20
3.	Homework & Assignments	5	4	20
4.	Projects	1	40	40
Overall Total				**100**

ATTENDANCE

The student should adhere to the rules of attendance as stated in the University Academic Regulation :-

1. Student must attend not less than 80% of lecture hours as required for the subject.

2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject.

NOTES

1. Homework and assignments are worth 20% of the overall grade, with reasonable submission flexibility. Homework and assignments will be assigned about every two weeks.
2. The syllabus is an outline of the course content, and contains an ambitious amount of material. Some of the content may be abbreviated or extended for additional lectures, based on the pace of the course. For particularly challenging topics, class or review sessions will be dedicated to going over example problems.
3. The project report will be accessed using a plagiarism software to ensure its integrity. Therefore proper citations of the sources and references are undoubtedly important.

Consult the Student Handbook and Plagiarism Policy for any questions regarding academic conduct and integrity.

Appendix II Sample Project Assignment for SME 4483

SME 4483 Combustion Processes
July 2009/2010

PROJECT 1

Aim: In this project, you are going to plot the concentration of species vs. time to see how species are produced and destroyed over time.

Specifics: You will be studying the thermal NOx mechanism as given below (this is also given in Chapter 5 of your text). Set up a system of simultaneous ordinary differential equations that describes the reaction rates of the various species. Use Matlab to solve this system of ODE's. Solve for an initial condition where only N_2 and O_2 exist with an equal concentration. Assume the whole reaction occurs at 2000K and 1 atm. Use your own judgment to determine the duration, t, that you want to study the reaction progress.

Deliverables: Your report should include the description of the problem, how you set up the problem, assumptions, method of solution, the Matlab code that you used, the results, the plot (all species on one graph), discussion and potential weaknesses in your solution method. Hand in your report on a CD. If you want to use MS Word, use version 2003 or below (in .doc format and NOT .docx)

Hint: You can refer to Rao's Applied Numerical Methods book (your text for Computational Methods course) for examples on how to program Matlab to solve simultaneous ODE problems. The scans of the relevant pages are posted on my website.

The **thermal** or **Zeldovich mechanism** consists of two chain reactions:

$$\mathrm{O} + \mathrm{N_2} \Leftrightarrow \mathrm{NO} + \mathrm{N} \qquad \text{(N.1)}$$

$$\mathrm{N} + \mathrm{O_2} \Leftrightarrow \mathrm{NO} + \mathrm{O}, \qquad \text{(N.2)}$$

The rate coefficients for N.1–N.3 are [22]

$$k_{\mathrm{N.1}f} = 1.8 \cdot 10^{11} \exp[-38{,}370/T(\mathrm{K})] \qquad [=]\,\mathrm{m^3/kmol\text{-}s},$$

$$k_{\mathrm{N.1}r} = 3.8 \cdot 10^{10} \exp[-425/T(\mathrm{K})] \qquad [=]\,\mathrm{m^3/kmol\text{-}s},$$

$$k_{\mathrm{N.2}f} = 1.8 \cdot 10^{7} T \exp[-4680/T(\mathrm{K})] \qquad [=]\,\mathrm{m^3/kmol\text{-}s},$$

$$k_{\mathrm{N.2}r} = 3.8 \cdot 10^{6} T \exp[-20{,}820/T(\mathrm{K})] \qquad [=]\,\mathrm{m^3/kmol\text{-}s},$$