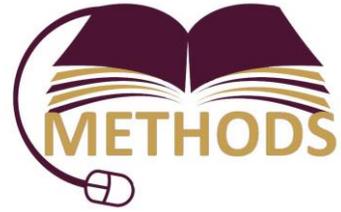




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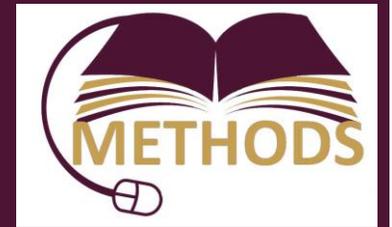


A CASE STUDY ON THE APPLICATION OF MODERN EDUCATIONAL METHODS IN DELIVERING UNDERGRADUATE ENGINEERING COURSES AT UJ

GCREEDER 2018

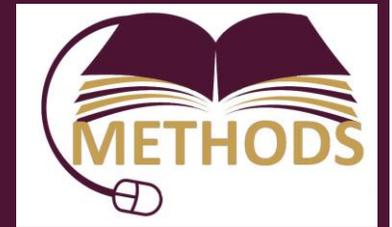
4th April 2018

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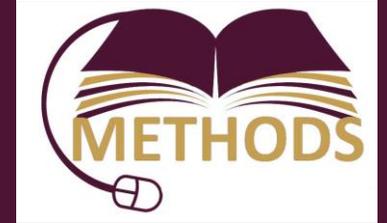
1. Introduction
2. Three Identified Problem within the Conventional Methodology.
3. The Three Pillars of the Pilot Methodology.
4. Activities and Assessments
5. Hours Spent by Students and Hours Spent by the Lecturer.
6. Challenges and Difficulties.
7. Feedback from Students.
8. Conclusions and Lessons Learnt.

I. INTRODUCTION



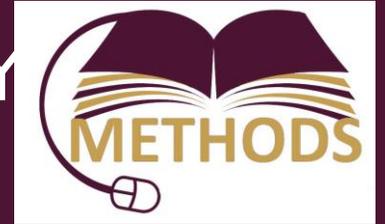
- As part of the METHODS project, a number of pilot courses were run.
- One course was run at Mechatronics Engineering as a METHODS pilot course: “Power Electronics & Drives 0908421” 3 credit hours.
- 45 students registered for the course.
- Also the same methodology was applied in three other courses delivered in the same semester in the Mechatronics Engineering Department: (Robotic Systems 0908563; Drive Systems 0908582; Selected Topics in Mechatronics 0908589).
- Another course is being run this semester (Mechatronics System Design 0908561).

I. INTRODUCTION



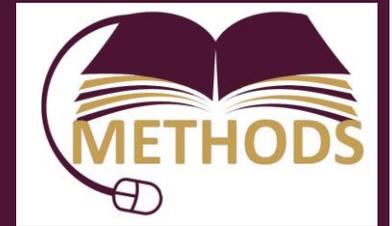
- This presentation will review this experience and will present the main themes and the lessons learnt.
- Although this was run as part of the METHODS project, the lessons learnt and conclusions are specific to my experience and might not be necessarily true of the whole project.

2. THREE PROBLEMS IN CONVENTIONAL METHODOLOGY



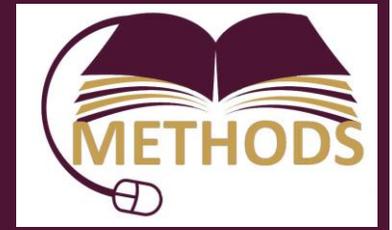
- The conventional method of teaching suffers from the following three problems:
 - The level of information retention by students is very poor (superficial understanding)..
 - Students in the lecture are passive observers.
 - Students postpone studying until a couple of days before the exam. Hence they simply try to cram the material in or even just memorise the answers to past questions.

3. THE PILLARS OF THE NEW METHODOLOGY



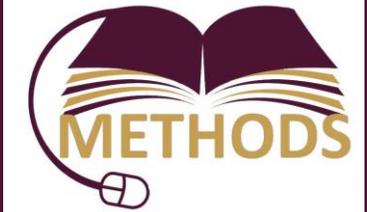
- Continuous assessment and feedback (weekly multiple choice quizzes, solving them in class and discussing the answers).
- Flipped Classroom (or semi-flipped classroom): the material is available online (on Moodle and on You Tube).
- Problem and project based learning (in class and off site): student are given problems to solve in class as groups; or are asked to visit a factory and identify and formulate a problem.

3. NOTES ON IMPLEMENTATION



- The main change in the delivery of the course was that there was one weekly quiz and that the course was flipped.
- The combination of Flipped Classroom and Continuous Testing and Feedback was a great success.
- It ensured that the students studied every week (on their own) and studied a small manageable chunk of material.
- They became active learners and came to the classroom ready and prepared and more engaged.
- This also freed up the classroom for more creative activities (e.g., in-class problem based learning; discussions; case studies; programming).
- In addition, practical on-site assignments were given to them to solve and submit a report.

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The diagram illustrates a control system architecture. It starts with an input U (Flow) entering a yellow block labeled $F(S)$, which contains "Hardware Physical Controller" and "Software". This block outputs a "Control signal" to a green block labeled $G(S)$, "Actuator System". The $G(S)$ block is divided into three sections: "Variable Speed Drive (Optional)", "Linear / Rotary Mechanical Drive (Mandatory)", and "Mechanical Drive (Optional)". The output of $G(S)$ is "Torque, Force", which enters a blue block labeled $P(S)$, "Plant". The $P(S)$ block contains "Plant System under control" and "Mechanical Rotary Mechanical translational Fluidic, thermal ...". The final output is Y (Outputs). A feedback loop labeled "Error" connects the output Y back to the input of the $F(S)$ block.

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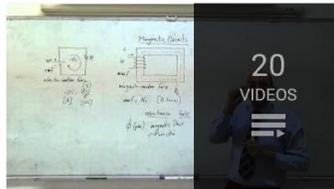


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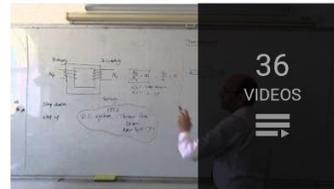
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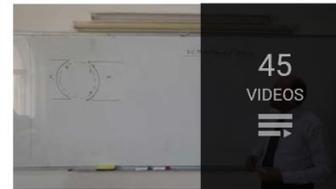
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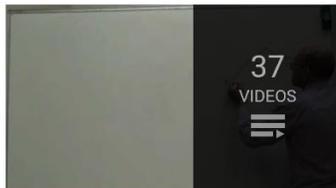
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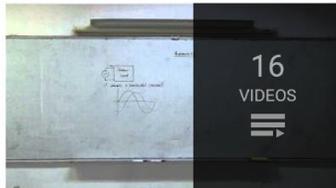
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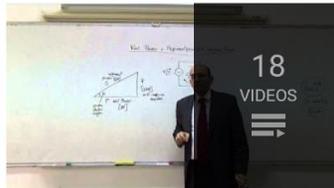
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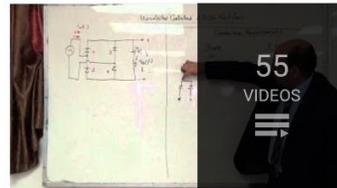
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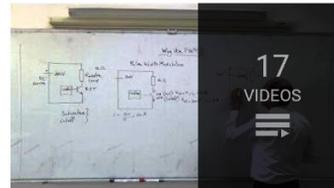
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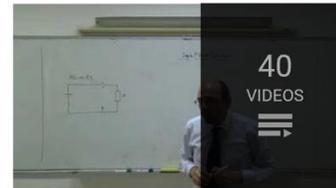
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Power Electronics 07: DC to DC Converters
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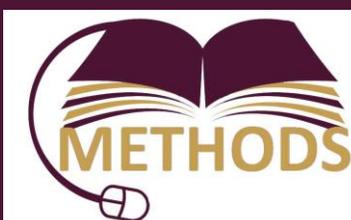
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NAMEPLATE



3-PHASE INDUCTION MOTOR

TYPE	ASGANE	CAT. NO.	DT0202	AMB	40°C
OUTPUT	20 HP 15 kW	FRAME	254T	CODE	G RATING CONT.
POLES	2	DESIGN	B	INS.	F
Hz	60	S.F.	1.15	PH.	3
VOLTS	230 / 460		ODP		
AMPS	45.6 / 22.8				
R.P.M.	3505				
SER. NO.	LQ 65B0130008				
BRG.	6309ZZC3	6208ZZC3			
WEIGHT	196	/	89	Lb / Kg	NEMA NOM. EFF. 90.2
USABLE ON	208 V NETWORK AT 50.5 AMP.		NEMA MIN. EFF. 88.5		
50HZ DATA	20	HP	190 / 380	VOLTS	57.3 / 28.7 AMPS

TEC Westinghouse MOTOR COMPANY
ROUND ROCK, TEXAS

CONNECTION

LINE LOW VOLT 2Δ LINE HIGH VOLT Δ

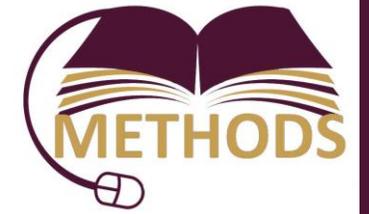
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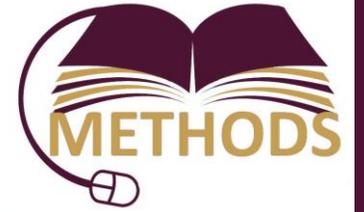
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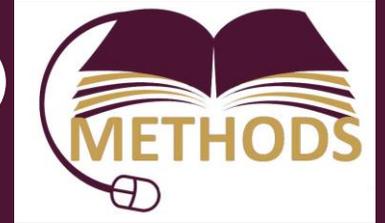
FACTORY VISIT TO IDENTIFY AND FORMULATE A PROBLEM



IN-CLASS PROBLEM BASED LEARNING

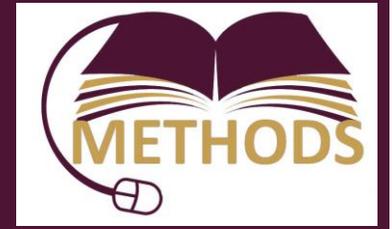


3. NOTES FROM THE CASE STUDY (POWER ELECTRONICS)



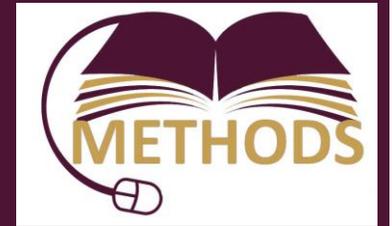
- The following are the main headlines from the case study:
- Around 125 hours spent by students on 3 credit hours (around 5-7 ECTS).
- Around 180 hours spent by lecturer on delivering the 3 credit hours.
- 8 quizzes given to students during the course ensured that students studied every week and were up to speed on all the material. This was the greatest success!!!!
- The Flipped classroom was a great success as it freed up the lecture time.
- In-class problem based learning was very successful.
- One problem based assignment was given.
- A group project was also held. Student worked in groups of 2 and 3.

3. NOTES FROM THE CASE STUDY



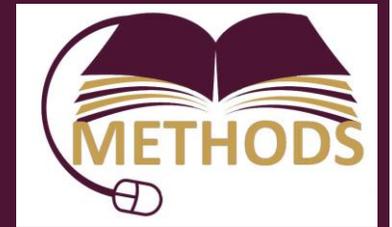
- Moodle is a great tool.
- It was used for submitting assignments and projects.
- Also use for quizzes.
- A forum was set up. But it was not really used by students.
- A group was set up on Facebook and it was used as a notice-board.
- The Facebook closed group was very useful as a notice-board.

3. NOTES ON MOODLE AS AN LMS



- The most suitable, accessible and SUSTAINABLE platform for development of the courses is MOODLE!
- Moodle can deal with all of the following:
 - Material.
 - Links to videos.
 - Online assessment quizzes and exams.
 - Assignment (students can submit essays and reports).
 - Forums for discussion.

SCREENSHOT FROM MOODLE



 [Final Computerised Exam \(2015/2016 1st\)](#)

12 Projects and Problem Based Learning

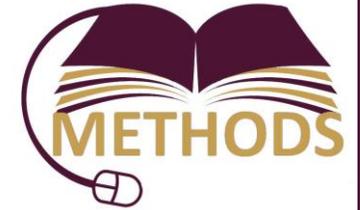
 [List of Offered Projects \(updated 13th November 2017\)](#)

 [Course Project Submission Portal](#)

 [Problem Based Learning: Problem Number 1](#)

 [Submission Portal for Problem 1 \(in Problem Based Learning\)](#)

QUIZZES IN MOODLE



UJ E-learning Office

King Abdullah II School for Information Technology

I.sharif 102518

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Wednesday 04 April 2018

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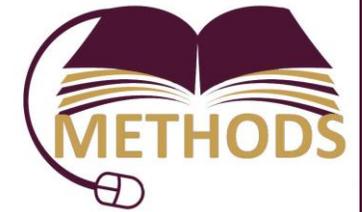
[Edit questions](#)

Section	Name	Attempts
11	Quiz 1: Revision and Basics	Attempts: 71
	Quiz 2: Magnetic Circuits	Attempts: 113
	Quiz 3: Electromagnetic Basics	Attempts: 68
	Quiz 4: Transformers	Attempts: 65

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QUIZZES IN MOODLE



Timing

Open the quiz 4 April 2018 05 35 Disable

Close the quiz 9 April 2018 05 35 Disable

Time limit (minutes) 30 Enable

Time delay between first and second attempt None

Time delay between later attempts None

Display

Questions per page 1

Shuffle questions Yes

Shuffle within questions Yes

Attempts

Attempts allowed 3

Each attempt builds on the last No

Adaptive mode No

Grades

Grading method Highest grade

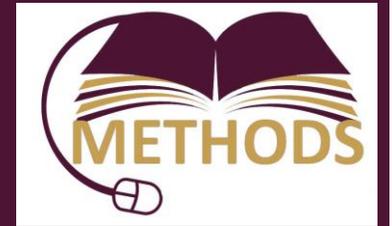
Apply penalties No

Decimal digits in grades 2

Review options

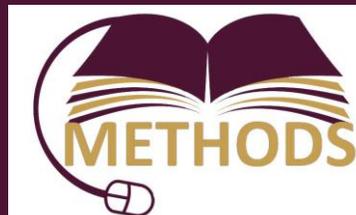
Immediately after the attempt	Later, while the quiz is still open	After the quiz is closed
<input type="checkbox"/> Responses	<input type="checkbox"/> Responses	<input type="checkbox"/> Responses
<input checked="" type="checkbox"/> Answers	<input checked="" type="checkbox"/> Answers	<input checked="" type="checkbox"/> Answers
<input type="checkbox"/> Feedback	<input type="checkbox"/> Feedback	<input type="checkbox"/> Feedback

4. ACTIVITIES AND ASSESSMENT



- Weekly quizzes.
- Mid term exam.
- Course project (in groups: building a product, factory visit, simulation...).
- Problem based project.
- Computerised Simulink/MATLAB exam.
- Final written exam.

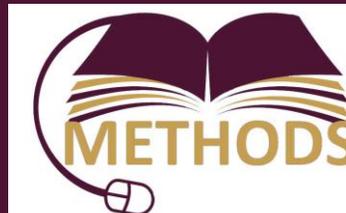
5. HOURS SPENT BY STUDENTS



Activity/Item	details	Non-contact hours (hours)	Contact hours (hours)
Lectures in class	3 x 15		45
Studying for the quizzes	6 hours per quiz, 8 quizzes	48	
Problem Based Learning Assignment		4	
Mid Term Exam		5	
Final exam (estimated)		10	
Course Project		10	
		77	45

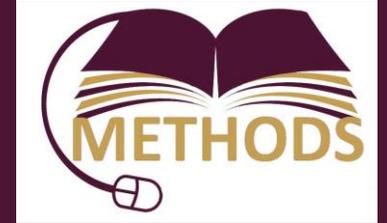
This gives a total of 125 hours (contact and non-contact) which is effectively equivalent to 5 ECTS units.

5. HOURS SPENT BY LECTURER



Activity/Item	Details	Hours
Preparing for the lectures	3 x 15	45
Lectures in class	3 x 15	45
In class Quizzes (announced)	8 multiple choice quizzes (10 questions in each quiz) 8 x 5	40
Problem Based Learning Assignment	Preparing the assignment and marking it	3
Mid Term Exam	Preparing the <u>mid term</u> exam	3
	Marking the <u>mid term</u> exam	7
Course Project	Presentations and marking reports	9
Final Computerised (Simulink) Exam	Preparing the computerised exam	4
	Marking the computerised exam	5
Final written exam	Preparing the final exam	4
	Marking the final exam	15
Total		180

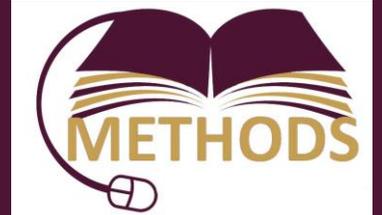
6. CHALLENGES: HYPE VERSUS REALITY



1. Hype vs Reality.
2. Until someone has tried to implement these methods, they will not realise the difficulties and challenges.
3. There is a big difference between talking about something and doing it.
4. The definition of a consultant:

Someone who can give you one hundred ways of how to do something and who has never actually done it himself!!!!!!!!!!!!!!!!!!!!!!

6. CHALLENGES: HYPE VERSUS REALITY



hype¹

/haɪp/ 

informal

noun

1. extravagant or intensive publicity or promotion.

"his first album hit the stores amid a storm of hype"

synonyms: [publicity](#), [advertising](#), [promotion](#), [marketing](#), [puff](#), [puffery](#), [propaganda](#), [exposure](#);
[More](#)

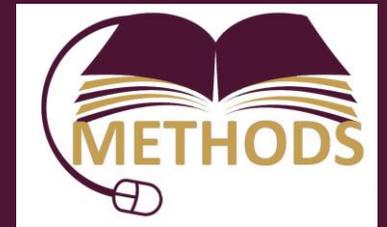
verb

1. promote or publicize (a product or idea) intensively, often exaggerating its benefits.

"an industry quick to hype its products"

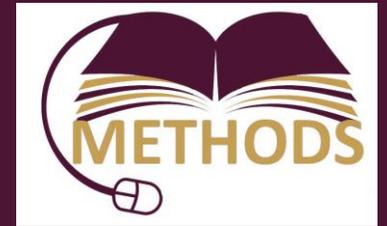
synonyms: [publicize](#), [advertise](#), [promote](#), [push](#), [boost](#), [merchandise](#), give publicity to, give a puff to, [puff](#), puff up, build up, talk up, beat/bang the drum for; *informal* [plug](#)
"this was another stunt to hype a new product"

6. CHALLENGES



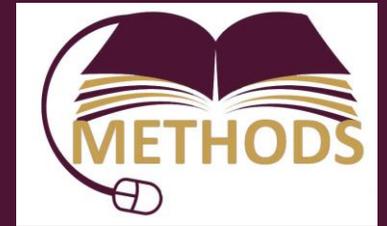
1. Excessive time needed by students.
2. Excessive time needed by lecturer.
3. The availability of adequate online material for flipped classroom.
4. Finding real life problems linked to industry for problem based learning.
5. There is a great need for self assessment online quizzes to help student check that they understand the material. (this has now been addressed: it is working now).
6. Large students numbers (sometimes 70 students in one course!!!).
7. Assessing students in the project assignment.

7. FEEDBACK FROM STUDENTS



- Positive feedback:
 - Continuous quizzes help them study regularly and keep up to date and understand the material much better.
 - When they come to class they can ask useful questions.
 - They like in-class problem based learning. They work in group.
- Negative feedback:
 - The class time must be used creatively.
 - They had a problem knowing how to deal with the problem based learning assignment.
 - The number of hours they have to put in is big.

8. LESSONS LEARNT AND CONCLUSIONS



- Students learn things much better by doing things themselves.
- Continuous assessment and immediate feedback are essential.
- Full flipping is not ideal. Semi-flipping is much better.
- Student learn in different styles. Thus it is necessary to have varied activities and varied methods of assesement.
- Quizzes on Moodle are ideal for the students and they save valuable lecture time.
- Factory visits are ideal for students' understanding for real life problem formulation.