香港城市大學
City University
of Hong Kong

Implementation of Outcome Based Teaching and Learning in EE
- Aligning teaching, learning and assessment with ILOs

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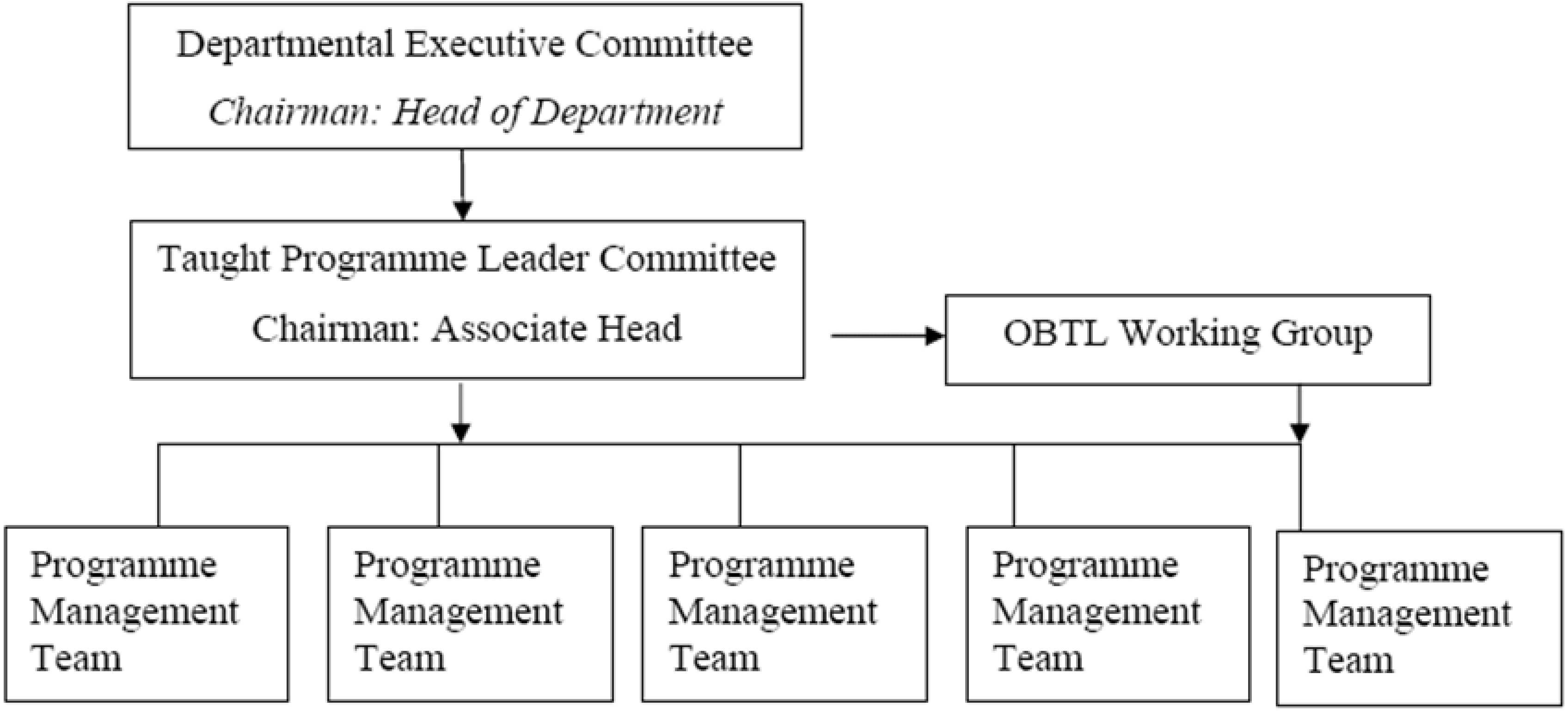
OBTL Coordinator, EE

Department of
ELECTRONIC ENGINEERING

Outlines

1. Overview of the OBTL framework in EE
2. Examples of Courses
    a. Engineering Analysis (EE3108)
        – E-Platform & Laboratory
    b. Electronics Product Design (EE3003)
        – Enhancing writing skill through LCC
3. Summary

Management Structure for Implementing OBTL in EE



Departmental Executive Committee

Chairman: Head of Department

Taught Programme Leader Committee

Chairman: Associate Head

OBTL Working Group

Programme Management Team

Programme Management Team

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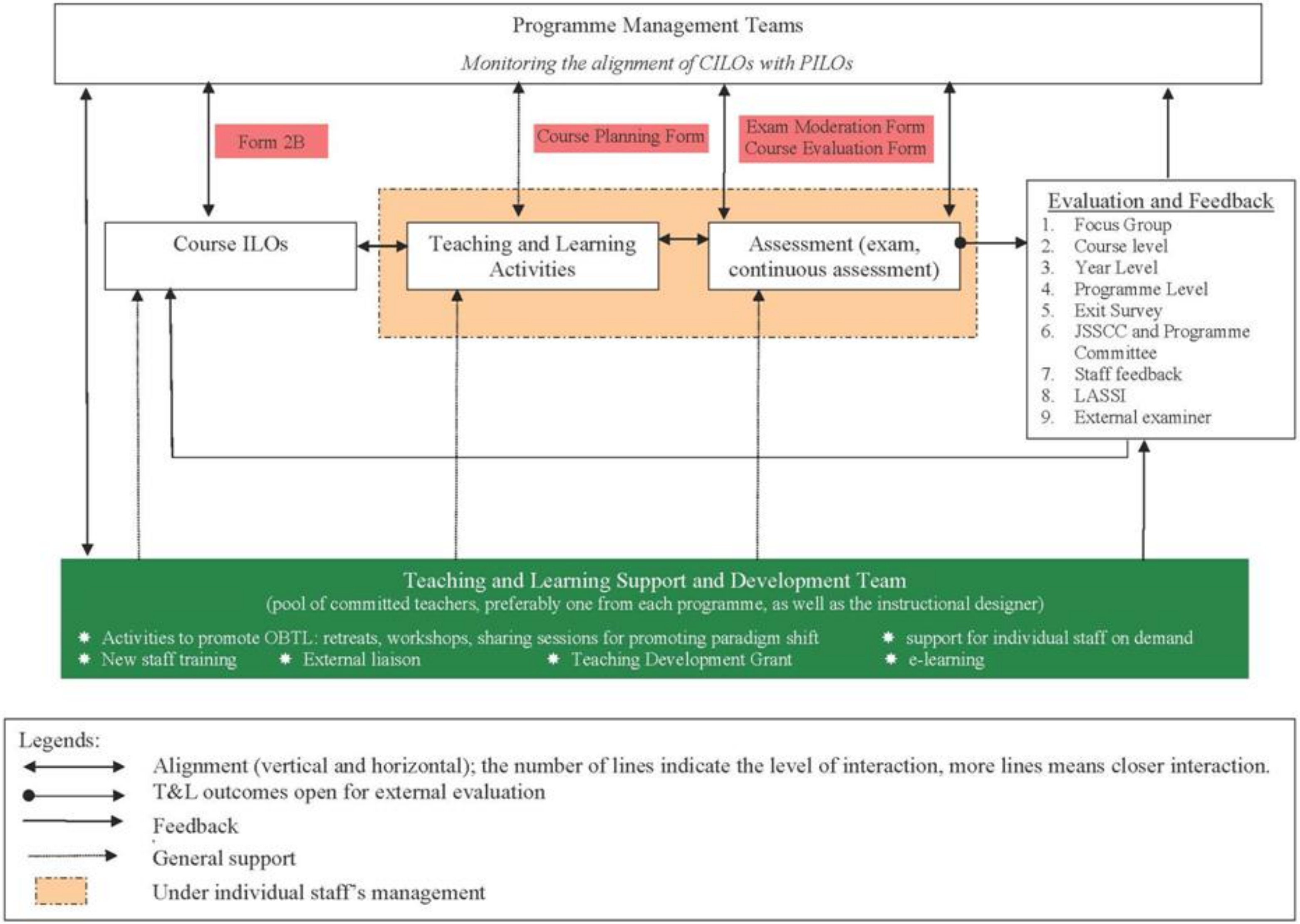
Quality Assurance System in PMT



Programme Management Teams

Monitoring the alignment of CILOs with PILOs

Form 2B

Course Planning Form

Exam Moderation Form
Course Evaluation Form

Course ILOs

Teaching and Learning Activities

Assessment (exam, continuous assessment)

Evaluation and Feedback

1. Focus Group
2. Course level
3. Year Level
4. Programme Level
5. Exit Survey
6. JSSCC and Programme Committee
7. Staff feedback
8. LASSI
9. External examiner

Teaching and Learning Support and Development Team

(pool of committed teachers, preferably one from each programme, as well as the instructional designer)

- Activities to promote OBTL: retreats, workshops, sharing sessions for promoting paradigm shift
- support for individual staff on demand
- New staff training
- External liaison
- Teaching Development Grant
- e-learning

Legends:

↔ Alignment (vertical and horizontal); the number of lines indicate the level of interaction, more lines means closer interaction.

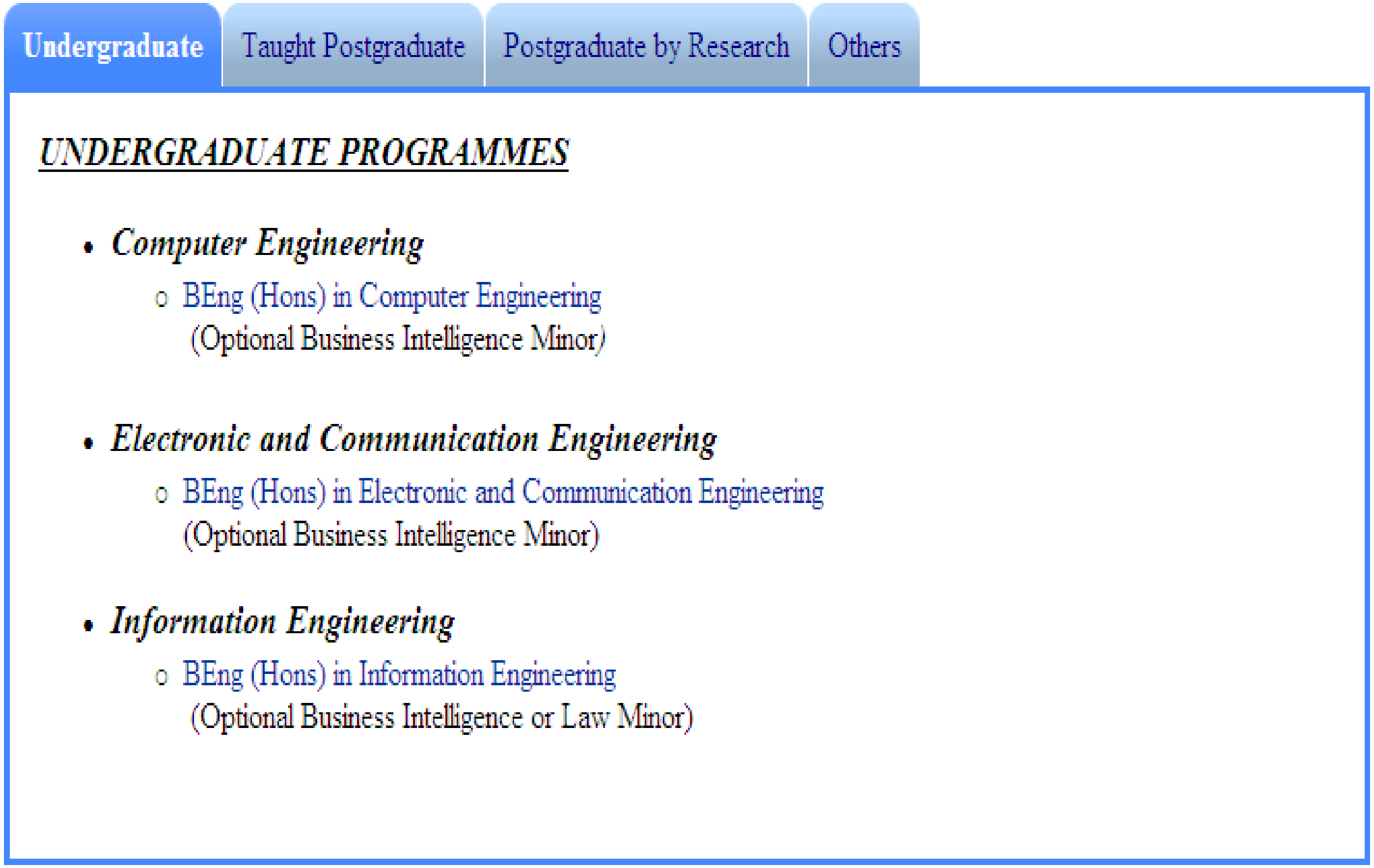
●→ T&L outcomes open for external evaluation

→ Feedback

⇢ General support

▨ Under individual staff's management

Programmes Offered by EE


Undergraduate
Taught Postgraduate
Postgraduate by Research
Others

UNDERGRADUATE PROGRAMMES

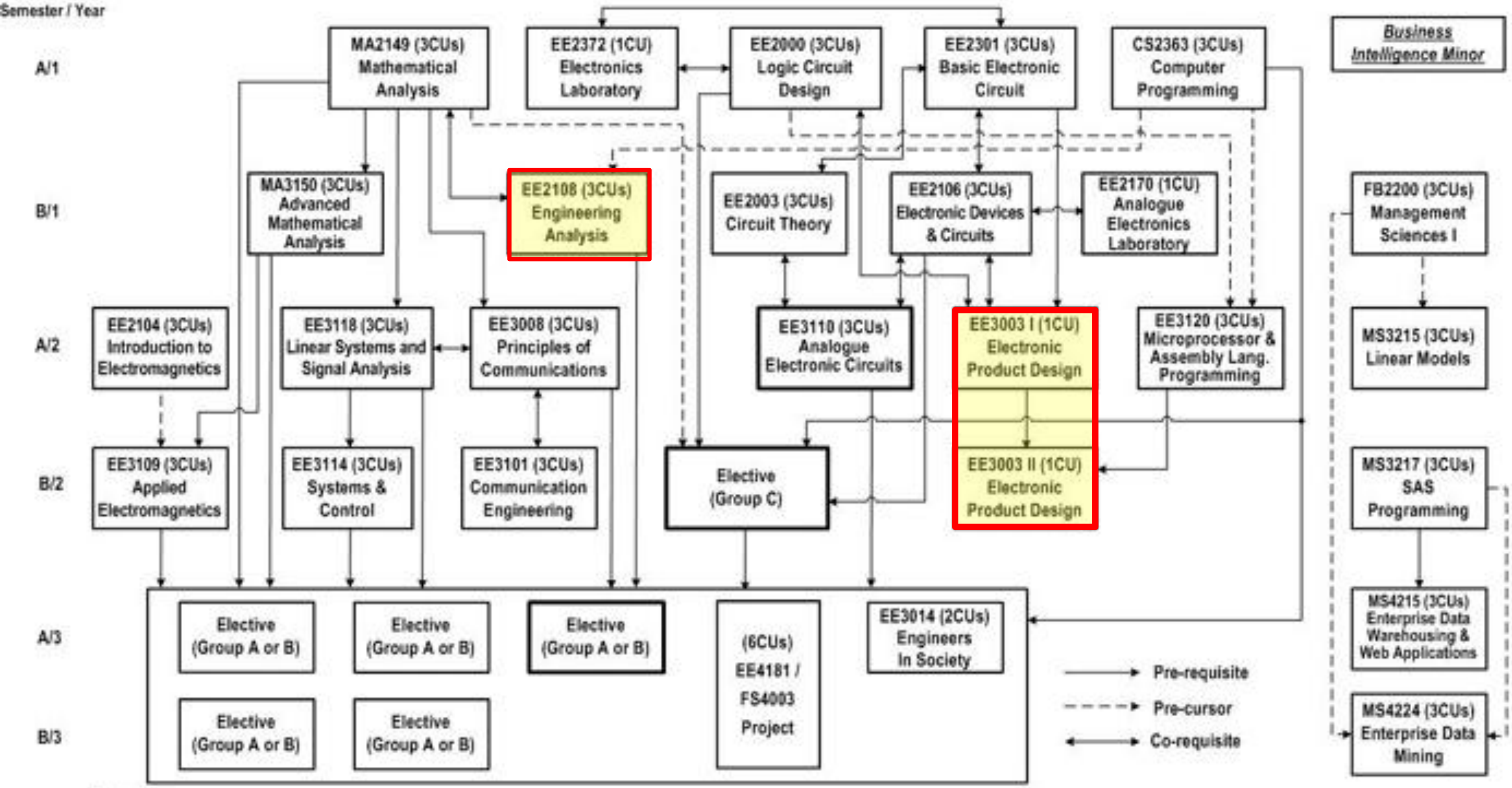
- *Computer Engineering*
  - BEng (Hons) in Computer Engineering
    (Optional Business Intelligence Minor)
- *Electronic and Communication Engineering*
  - BEng (Hons) in Electronic and Communication Engineering
    (Optional Business Intelligence Minor)
- *Information Engineering*
  - BEng (Hons) in Information Engineering
    (Optional Business Intelligence or Law Minor)

Programme Intended Learning Outcome

1. An ability to apply knowledge of mathematics, science and engineering.
2. An ability to design and conduct experiments as well as to analyze and interpret data.
3. An ability to design systems, components, or processes that conform to a given specification and according to recognized professional practices.
4. An ability to function effectively and responsibly as a team member.
5. An ability to identify, formulate and solve engineering problems.
6. Awareness of professional and ethical responsibilities.
7. An ability to communicate effectively.
8. Knowledge in contemporary issues and an awareness of the impact of engineering solutions in a broad, global and societal context.
9. Recognition of the need for life-long learning.
10. An ability to use necessary engineering tools.

Last update: 7 Aug 09

Programme Structure and Flowchart of
BEng(Hons) in Electronic and Communication Engineering / BEng(Hons) in Electronic and Communication Engineering (Business Intelligence Minor)
2009 / 2010 intake cohort


Semester / Year
A/1
B/1
A/2
B/2
A/3
B/3
MA2149 (3CUs) Mathematical Analysis
EE2372 (1CU) Electronics Laboratory
EE2000 (3CUs) Logic Circuit Design
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CS2363 (3CUs) Computer Programming
Business Intelligence Minor
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EE2003 (3CUs) Circuit Theory
EE2106 (3CUs) Electronic Devices & Circuits
EE2170 (1CU) Analogue Electronics Laboratory
FB2200 (3CUs) Management Sciences I
EE2104 (3CUs) Introduction to Electromagnetics
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EE3008 (3CUs) Principles of Communications
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Elective (Group C)
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MS3217 (3CUs) SAS Programming
Elective (Group A or B)
Elective (Group A or B)
Elective (Group A or B)
(6CUs) EE4181 / FS4003 Project
EE3014 (2CUs) Engineers In Society
MS4215 (3CUs) Enterprise Data Warehousing & Web Applications
Elective (Group A or B)
Elective (Group A or B)
MS4224 (3CUs) Enterprise Data Mining
Pre-requisite
Pre-cursor
Co-requisite

Remarks:

1/ Apart from the above courses, students are required to take EE4091 Basic Training I and EE4092 Basic Training II in Year 1 and 2 summer respectively. Students should also fulfill 6 credits of University Language Requirements, 6 credits of Chinese Civilization and at least 3 CUs of General Education courses and 6 CUs of Out-of-Discipline (OOD) courses. For BEngECE(BIM), the GE/OOD can be fulfilled by the Minor's courses.

2/ Students opting for BEngECE(BIM) will take 4 electives instead of 5. They will also take EE3110 in Year 2 Sem B and Group C Elective in Year 3 Sem B.

3/ For detailed course descriptions, please refer to the departmental website: http://www.ee.cityu.edu.hk

Constructive Alignment of BEngECE PILOs with Courses

PILO **Courses**	1	2	3	4	5	6	7	8	9	10
EE2000 Logic Circuit Design	T/P		T/P							
EE2003 Circuit Theory	T/P									
EE2070 Fundamental Electronics Laboratory	P	P			P	T/P	P			P
EE2104 Introduction to Electromagnetics	T/P									
EE2106 Electronic Devices and Circuits	T/P									
EE2170 Analogue Electronics Laboratory	P	P			P	T/P	P			P
EE3108 Engineering Analysis	T/P				T/P					T/P
EE3008 Principles of Communications	T/P	T/P		P	T/P		P	T		P
EE3109 Applied Electromagnetics	T/P	T/P		P	T/P		P			P
EE3101 Communication Engineering	T/P/M	T/P		P	T/P		P			P
EE3110 Analogue Electronic Circuits	T/P	T/P		P	T/P		P			P
EE3114 Systems and Control	T/P	T/P		P	T/P		P			P
EE3118 Linear Systems and Signal Analysis	T/P	T/P		P	T/P		P			P
EE3120 µP and Assembly Language Programming	T/P	T/P	T/P	P	T/P		P			T/P
CS2363 Computer Programming	T/P		T/P		T/P					T/P
MA2149 Mathematical Analysis	T/P									
MA3150 Advanced Mathematical Analysis	T/P									
EE3003(I) Electronic Product Design	P	P	T/P	P	P	T/P	P		P	T/P
EE3003(II) Electronic Product Design	T/P	PM	T/P/M	P/M	P	T/P	P	P	P	T/P/M
EE3014 Engineers in Society						T/P		T/P/M		
EE4091 Basic Training I	T/P	P	T/P		P					T/P
EE4092 Basic Training II	P	P	P	#T/P/M	P	P/M	P		P	P
EE4181 Final Year project	P	P	P		P/M		P/M	P	P/M	P
Elective (A), (B) and (C)	T/P		T/P		T/P					
English							T/P			
OOD								T/P		
General Education								T/P		
Chinese Civilization								T/P		

T-taught, P-practiced, M-measured

EE3180 Engineering Analysis

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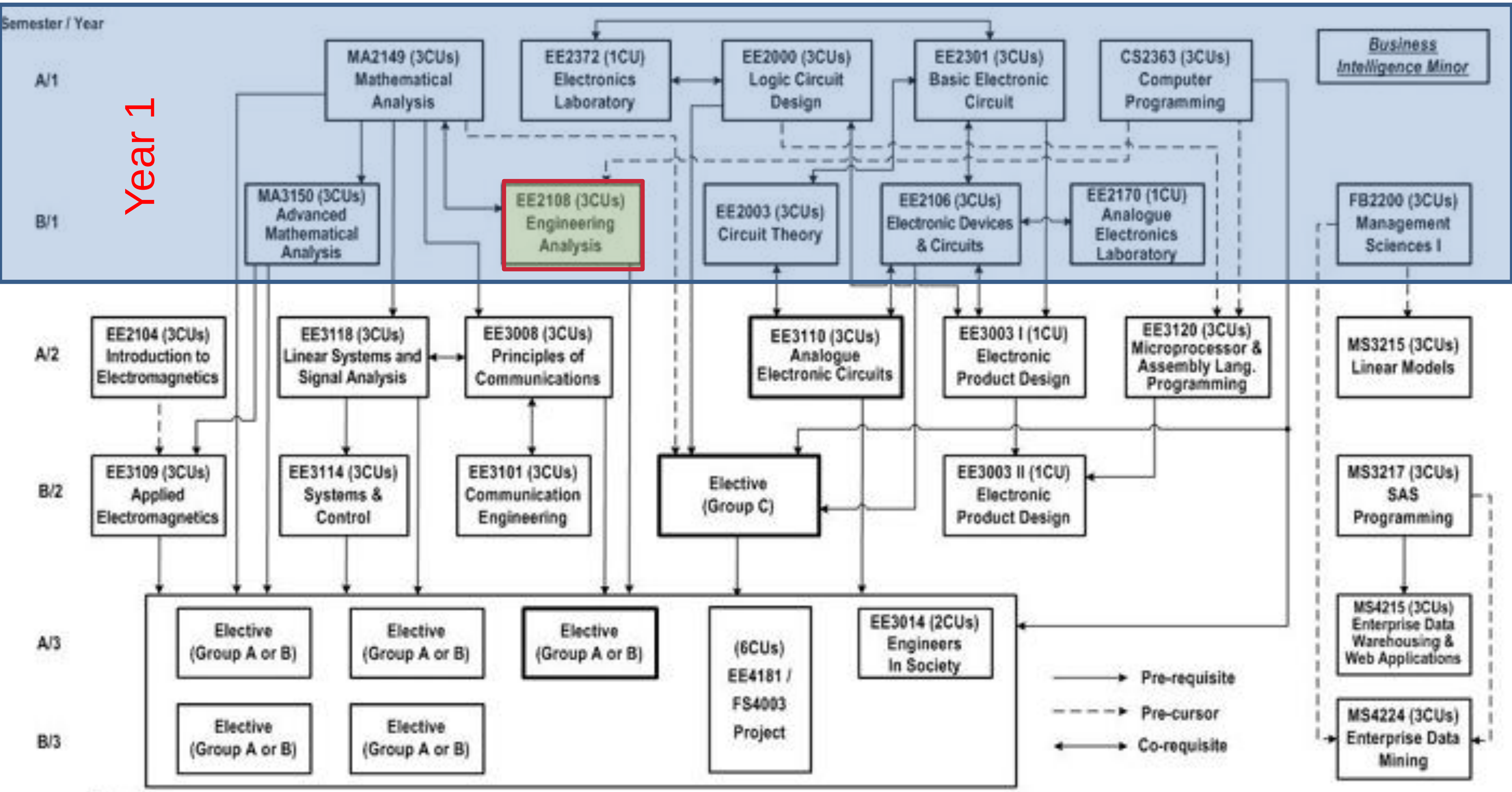

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Background Information

- BEngECE Programme
- Target First Year Students
- Large Class Size 100+
- A large variety of background
  - some good and some poor in programming skills
- Focus on the implementation of numerical algorithm in MATLAB programming environment.
  - Student are expected to apply the skills learned in this course in other subsequent courses

Course ILOs for Engineering Analysis

CILO 1: To identify different possible types of errors particular to numerical computation.

CILO 2: To express a range of fundamental numerical algorithms in form of flowchart, pseudo code and MATLAB programming language.

Higher Level in Understanding

CILO 3: To implement a given algorithms in MATLAB programming environment.

CILO 4: To apply numerical analysis algorithms in solving a given engineering problem.

Adopting new TLAs and ATs to meet the CILOs

1. Meet the needs of OBTL
    - limitations in conventional TLAs and ATs
        - programming assignments, and written quizzes & examination
2. Set up a Blackboard e-platform to
    - motivate student higher level learning
    - conduct assessments, and monitor student learning over a time period
    - offer computer assisted assessments/laboratory activities
3. Provide students with more opportunities to present their works

Limitations of conventional TLAs and ATs

Case 1

A part-time student who have scored a high grade in EE3108…

"**To score a high grade** in EE3108 is not very difficult as long as you **know the trick to attempt questions** in exam and test. In fact, you do not need to revise so much materials."

Case 2

A full-time student who have **scored a high grade in EE3108**.

During the handling a FYP problem, the student never thought of using MATLAB to solve a simple root searching problem. When I asked the student to use MATLAB to solve it, the **student do not know how to write a root searching program**.

Case 3

A full-time student who had taken EE3108.

The student told me that it is **very easy to understand the concepts** of the various algorithms. However, she often **felt very frustrating in implementing the algorithms with program**. **She preferred me to just access the concepts** like previous forms of assessments.

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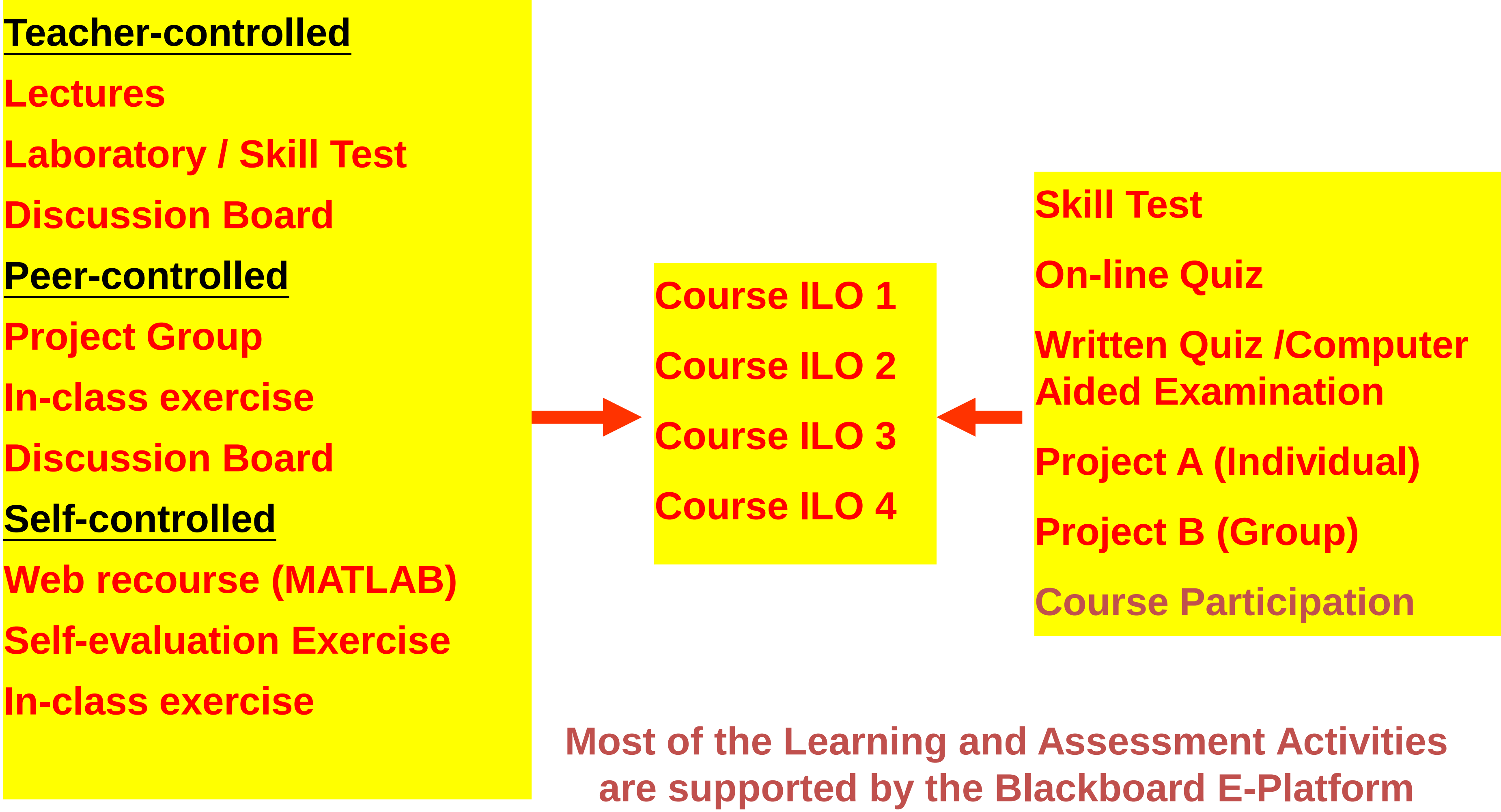
Constructive Alignment between CILOs, TLAs and ATs



Teacher-controlled

Lectures

Laboratory / Skill Test

Discussion Board

Peer-controlled

Project Group

In-class exercise

Discussion Board

Self-controlled

Web recourse (MATLAB)

Self-evaluation Exercise

In-class exercise

Course ILO 1

Course ILO 2

Course ILO 3

Course ILO 4

Skill Test

On-line Quiz

Written Quiz /Computer Aided Examination

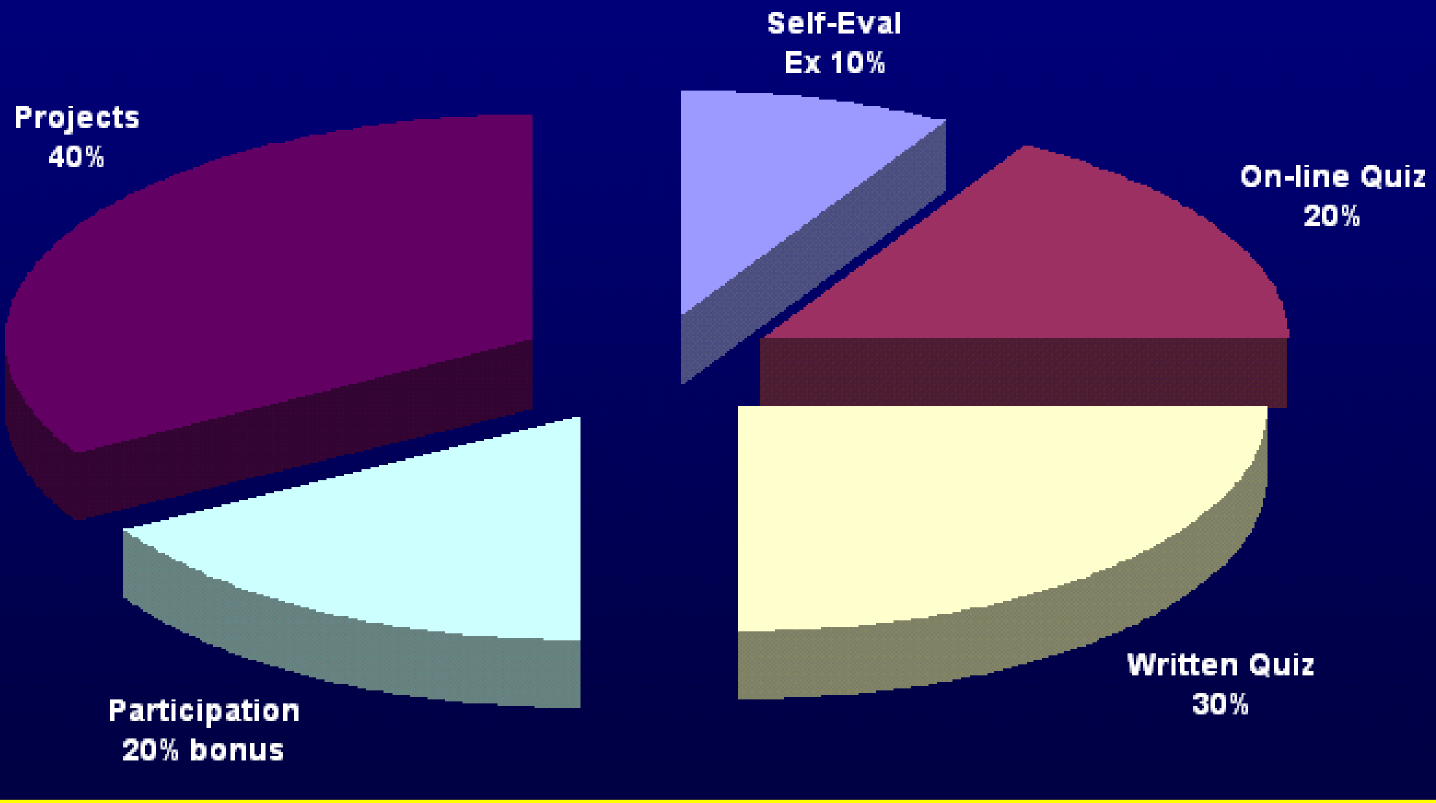
Project A (Individual)

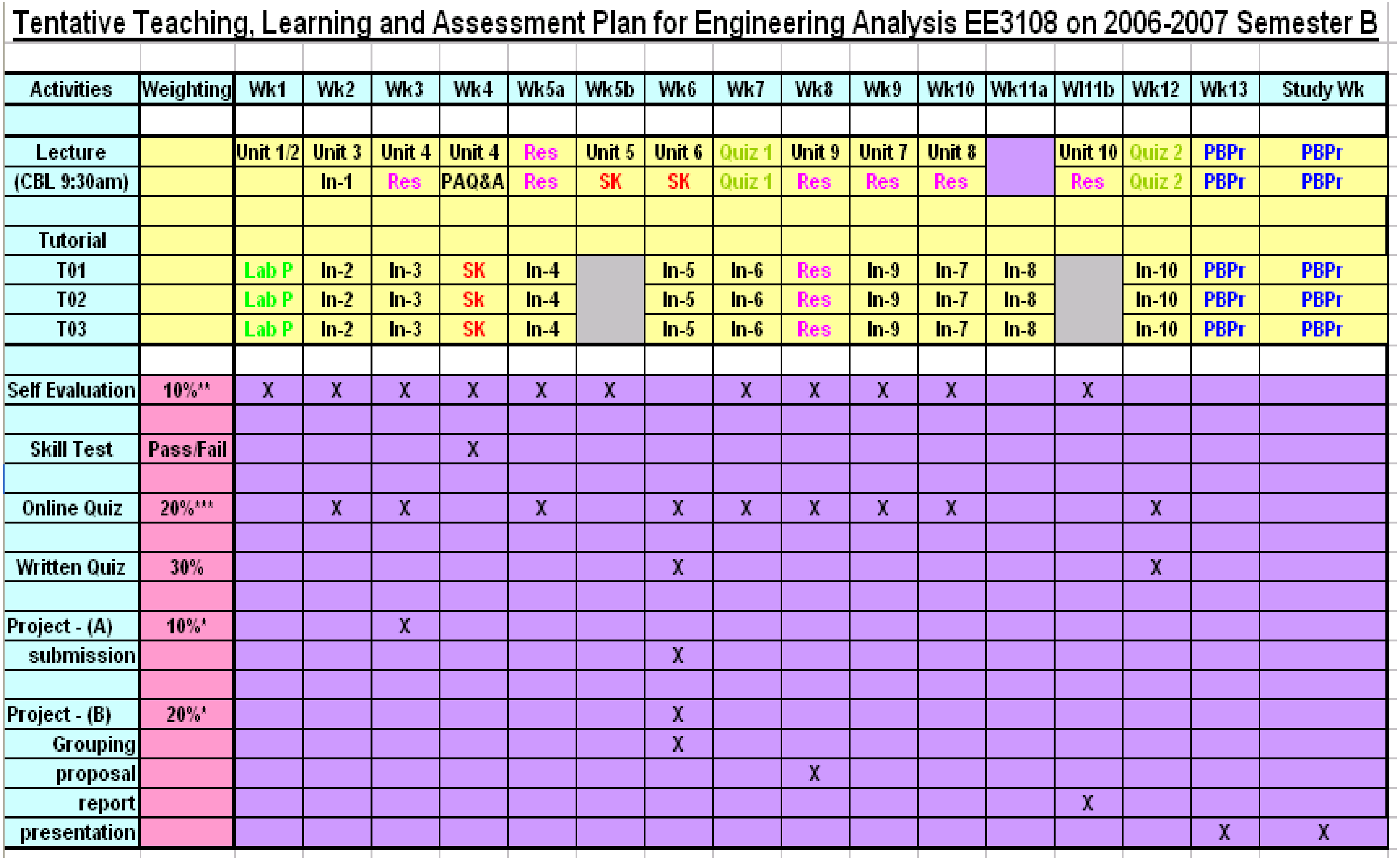
Project B (Group)

Course Participation

Most of the Learning and Assessment Activities are supported by the Blackboard E-Platform

Assessment Weighting of EE3108



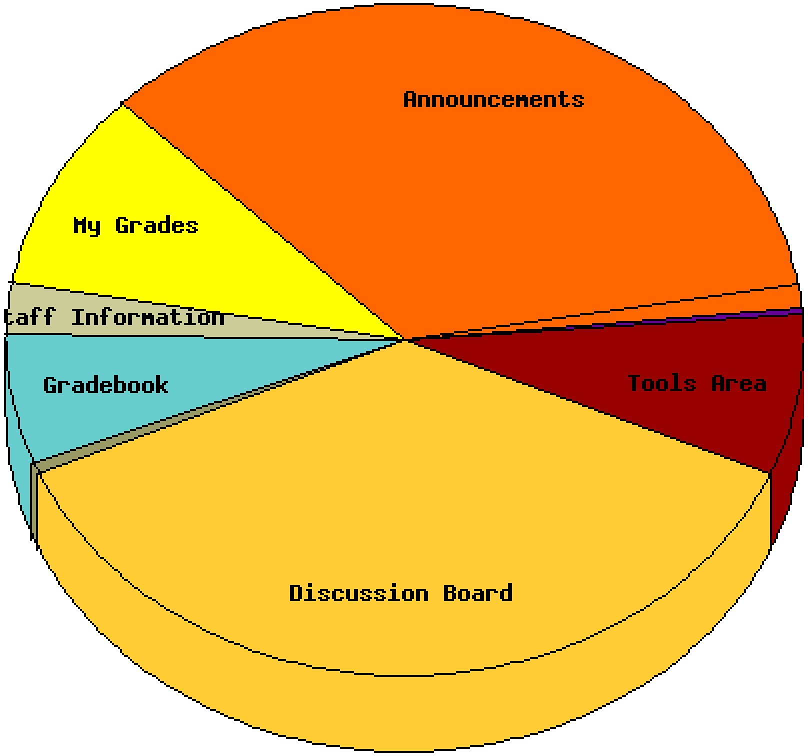


Tentative Teaching, Learning and Assessment Plan for Engineering Analysis EE3108 on 2006-2007 Semester B

Activities	Weighting	Wk1	Wk2	Wk3	Wk4	Wk5a	Wk5b	Wk6	Wk7	Wk8	Wk9	Wk10	Wk11a	Wl11b	Wk12	Wk13	Study Wk
Lecture		Unit 1/2	Unit 3	Unit 4	Unit 4	Res	Unit 5	Unit 6	Quiz 1	Unit 9	Unit 7	Unit 8		Unit 10	Quiz 2	PBPr	PBPr
(CBL 9:30am)			In-1	Res	PAQ&A	Res	SK	SK	Quiz 1	Res	Res	Res		Res	Quiz 2	PBPr	PBPr
Tutorial																	
T01		Lab P	In-2	In-3	SK	In-4		In-5	In-6	Res	In-9	In-7	In-8		In-10	PBPr	PBPr
T02		Lab P	In-2	In-3	Sk	In-4		In-5	In-6	Res	In-9	In-7	In-8		In-10	PBPr	PBPr
T03		Lab P	In-2	In-3	SK	In-4		In-5	In-6	Res	In-9	In-7	In-8		In-10	PBPr	PBPr
Self Evaluation	10%**	X	X	X	X	X	X		X	X	X	X		X			
Skill Test	Pass/Fail				X												
Online Quiz	20%***		X	X		X		X	X	X	X	X			X		
Written Quiz	30%							X							X		
Project - (A)	10%*			X													
submission								X									
Project - (B)	20%*							X									
Grouping								X									
proposal										X							
report														X			
presentation																X	X

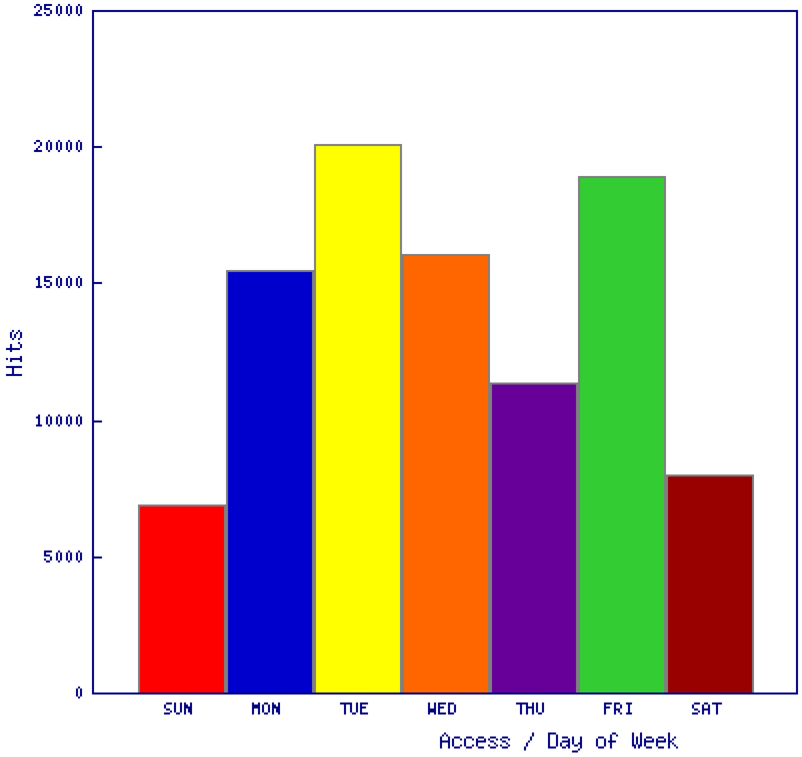
Evaluation of Students' Learning

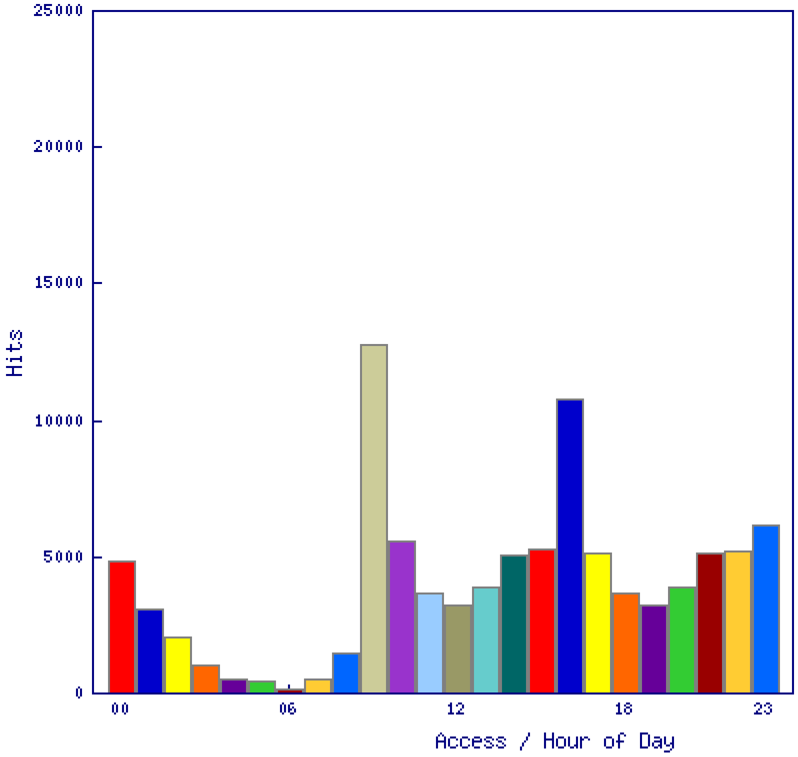
Statistics in accessing blackboard platform for EE3108 over one semester



Selected Activities	Number of hits
Overall	39,000
Announcement	13,000
Discussion Board	14,000

Access Traffic Patterns in using BB for EE3108



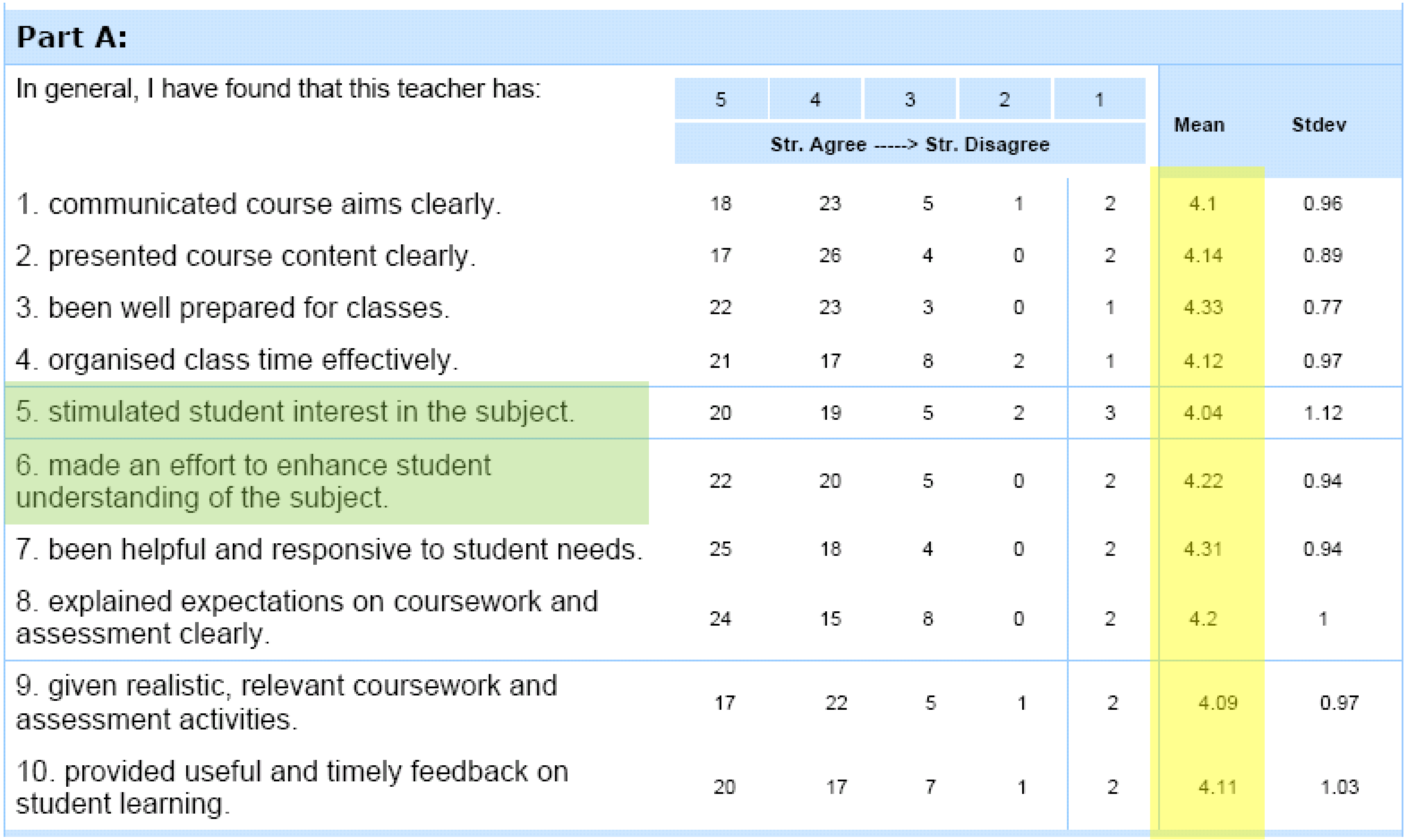


Blackboard (BB) Usage Intensity

Usage Intensity	Announcement	Discussion Board	Overall
High Usage (> 200 hits)	11%	21%	57%
Medium Usage (>100 hits)	63%	35%	92%
Low Usage (< 25 hits)	1%	31%	1%

Remarks: If a student accesses a BB item once a day over the entire Semester, the total number of hit is approximately 100.

Statistical Feedback (TFQ)



Part A:

In general, I have found that this teacher has:	5	4	3	2	1	Mean	Stdev
	Str. Agree ----> Str. Disagree						
1. communicated course aims clearly.	18	23	5	1	2	4.1	0.96
2. presented course content clearly.	17	26	4	0	2	4.14	0.89
3. been well prepared for classes.	22	23	3	0	1	4.33	0.77
4. organised class time effectively.	21	17	8	2	1	4.12	0.97
5. stimulated student interest in the subject.	20	19	5	2	3	4.04	1.12
6. made an effort to enhance student understanding of the subject.	22	20	5	0	2	4.22	0.94
7. been helpful and responsive to student needs.	25	18	4	0	2	4.31	0.94
8. explained expectations on coursework and assessment clearly.	24	15	8	0	2	4.2	1
9. given realistic, relevant coursework and assessment activities.	17	22	5	1	2	4.09	0.97
10. provided useful and timely feedback on student learning.	20	17	7	1	2	4.11	1.03

Written Feedbacks in TFQ

- The blackboard is a good place for student and teacher communication and learning.
- The discussion board is useful medium for ask question and find the answer.
- I most like the open Book test, it focus on the student understanding and not to memorize the formula.

Written Feedback in TFQ

- Project A&B can enhance our study motivation and problem solving skill.
- During studying this subject, I find that the assignments (projects) are very helpful to us. These two assignments are very related to our study and also give us a very good chance to practice our test and examination.
- Too much workload (extreme)

Student #1 commenting the teaching mode of EE3108

- It is very good to learn MATLAB during Week 1 tutorial (laboratory) in CSC. This allow students (her) to have a first hand experience to handle the software. This help them to relieve the anxiety in programming.
- The provision of on-line resource to self-study MATLAB is important and helpful. Since this enable students to learn the MATLAB at their own pace.
- Notes with illustration and programming examples are very helpful in implementing the algorithms without the necessary memorizing each program.

Student #2 commenting the teaching mode of EE3108

- The provision of Self-evaluation exercise (with instant feedback) after each lecture enables the students to identify any mis-concepts immediately.

- Discussion Board is very effective to post questions and collect comments. This will encourage students to clear up any questions as soon as possible.

- Short-quiz at the beginning of each tutorial class (laboratory) forced students to revise the lecture notes after each lecture. The immediate feedback on short-quiz results motivate them to learn.

Student #3 commenting the teaching mode of EE3108

- Q&A and practicing sessions (laboratory) allow students to have instant feedbacks on programming skill.
- Projects enable students to have experience to handle real problems. In particular, group project enable students to have peer learning environment.
- In general, if anyone can preview the notes before lecture, pay attention during lecture and, revise & do the self-evaluation exercises after each lecture to clarify any mis-concepts, the student think this course is not difficult to study.

Reflections

- Blackboard, if probably used, is a very good platform in enhancing students learning, monitoring student learning activities..
- To force students into an active learning mode is important.
- Workload is subjective, it depends on student’s learning attitude.
- From the feedback received, most students feel they benefited from the current implementation of OBTL for EE3108.

EE3003 Electronic Product Design

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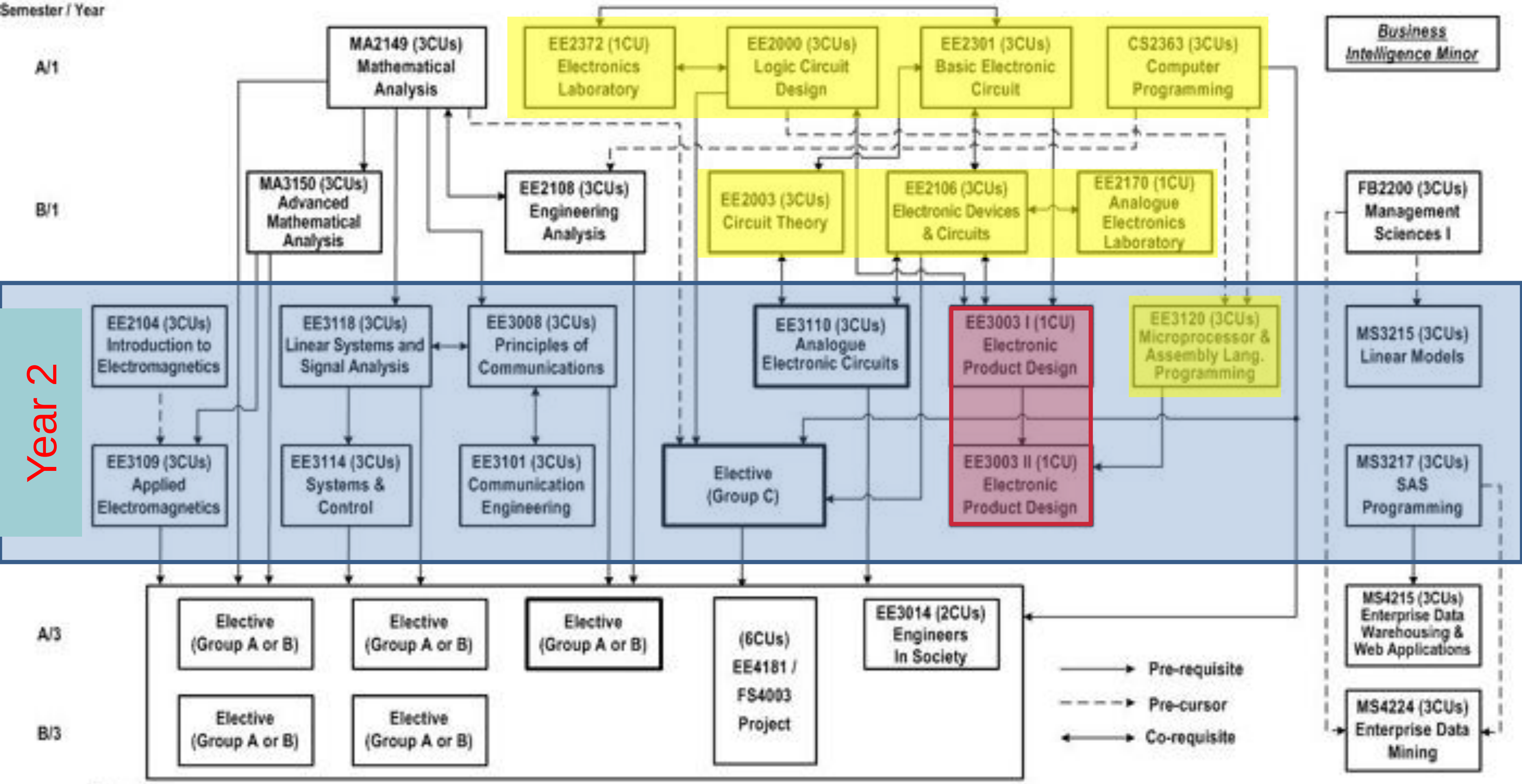

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Background Information

- EE 3003 is a laboratory-based course, lasting two semesters targeting Year 2 students.
- Students are working in groups. Each group has 3 to 4 students.
- Each group has to build a circuit and will then be asked to design a test jig for testing the circuit.
- In semester B, students will be asked to design a circuit or system that will integrate with three key components – linear / digital circuit design, microprocessor programming and interfacing.

Course ILOs for Electronic Product Design

CILO 1: To identify and recognize the essential design and production procedures of electronic products.

CILO 2: To apply fundamental analysis methods and theorems to the solution of the case study.

CILO 3: To design and implement a prototype for meeting the case study requirements.

CILO 4: To acquire hands-on experience and problem-solving skills in electronic product design.

CILO 5: To acquire experience in presenting the design work.

CILO 6: To form the foundation for the Electronic Product Manufacturing Project, the penultimate part of the industrial training programme run in the summer semester.

Adopting new TLAs and ATs to meet the CILOs

- Meet the needs of OBTL
- Set up a platform for the laboratory supervisors to conduct group and individual assessments, and monitor student learning over a time period
- Provide students with more opportunities to write and present their works
- Introduce Language Company Course (LCC) to assist student in writing skills. (PLIO 7)

TLAs in EE3003

Each student has

- One laboratory kit
  - Laboratory manual
  - Laboratory schedule
- One Logbook
  - Attendance record
  - Development plan
  - Weekly development progress
  - Group and individual assignments

TLAs in EE3003

Weekly development report

- Every week, students have to write a one-page summary to briefly report the development progress.

- The laboratory supervisor can keep tracking the progress of each student and giving necessary feedback.

Sample [assessment table]

Item	Week	Activity	Weighting	Level of achievement (0 – 3)
B1	2	Development plan	3.0	
B2	2	Development progress in Week 1	1.0	
B3	3	Development progress in Week 2	1.0	
		…		
B13	13	Development progress in Week 12	1.0	

Group and individual assignments

Item	Week	Assignment	Weighting	Format	Rating (0 – 4)	
					Individual	**Group**
C1	2	Understanding of the circuit	3.0	Logbook		N/A
C2	3	Two-page summary about the operating principles of the circuit	3.0	Group report	N/A	
C3	6	Demonstration of the circuit	3.0	Demo		
C4	7	Five-page testing report with the bill of materials	5.0	Group report		
C5	8	Two-page proposal on the operating principles of the test jig circuit	3.0	Group report	N/A	
C6	12	Demonstration of the test jig	5.0	Demo		
C7	13	Formal presentation of the starter circuit and test jig	5.0	Demo		
C8	13	Five-page report about the test jig, including operating principles, testing results, bill of materials	5.0	Group report		

Language Companion Course (LCC)

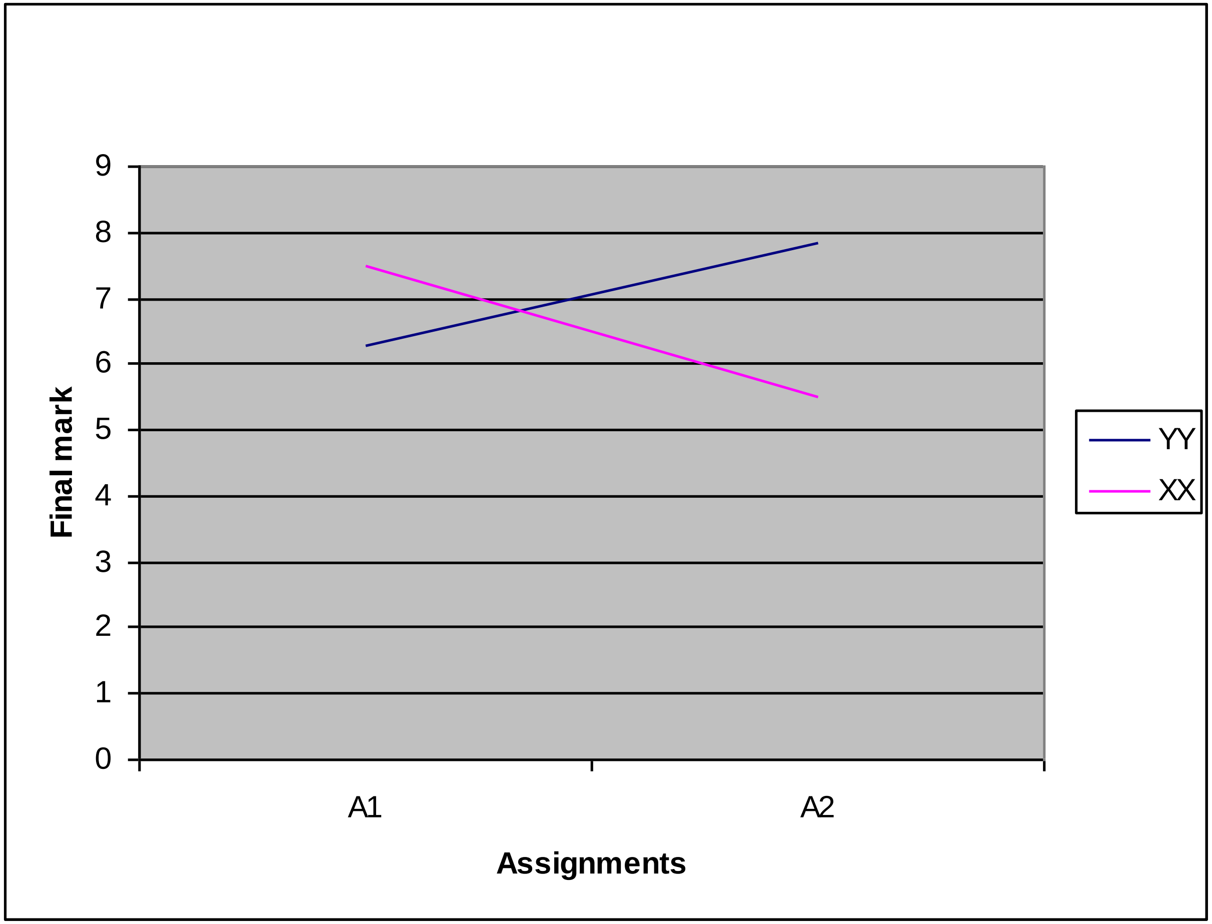
- Form of support:
  - to provide subject teachers and language specialists with a platform for helping students improve their academic writing ability in English.
  - The main rationale behind the LCC is that language learning takes place more effectively within the context of the courses in students' chosen subject disciplines.

Implementation of LCC in EE3003

- Students have to submit the two five-page reports to EDO two weeks before the due date.
- After receiving the first draft of the reports, the language tutors will give students some comments on English and will ask them to submit the report again.
- The language tutors will mark the second submission and the laboratory supervisors will receive the final version.
- After finishing the first report, a sharing session will be organized by the EDO. The tutor will share with the students the common mistakes found.
- The marks given by the language tutors will contribute 10% of the overall mark for the reports.

Evaluation of Students’ Learning in writing skills

Impact of the no. of submissions on the final mark



YY: Groups that have submitted at least 1 draft
XX: Groups that have not submitted any draft

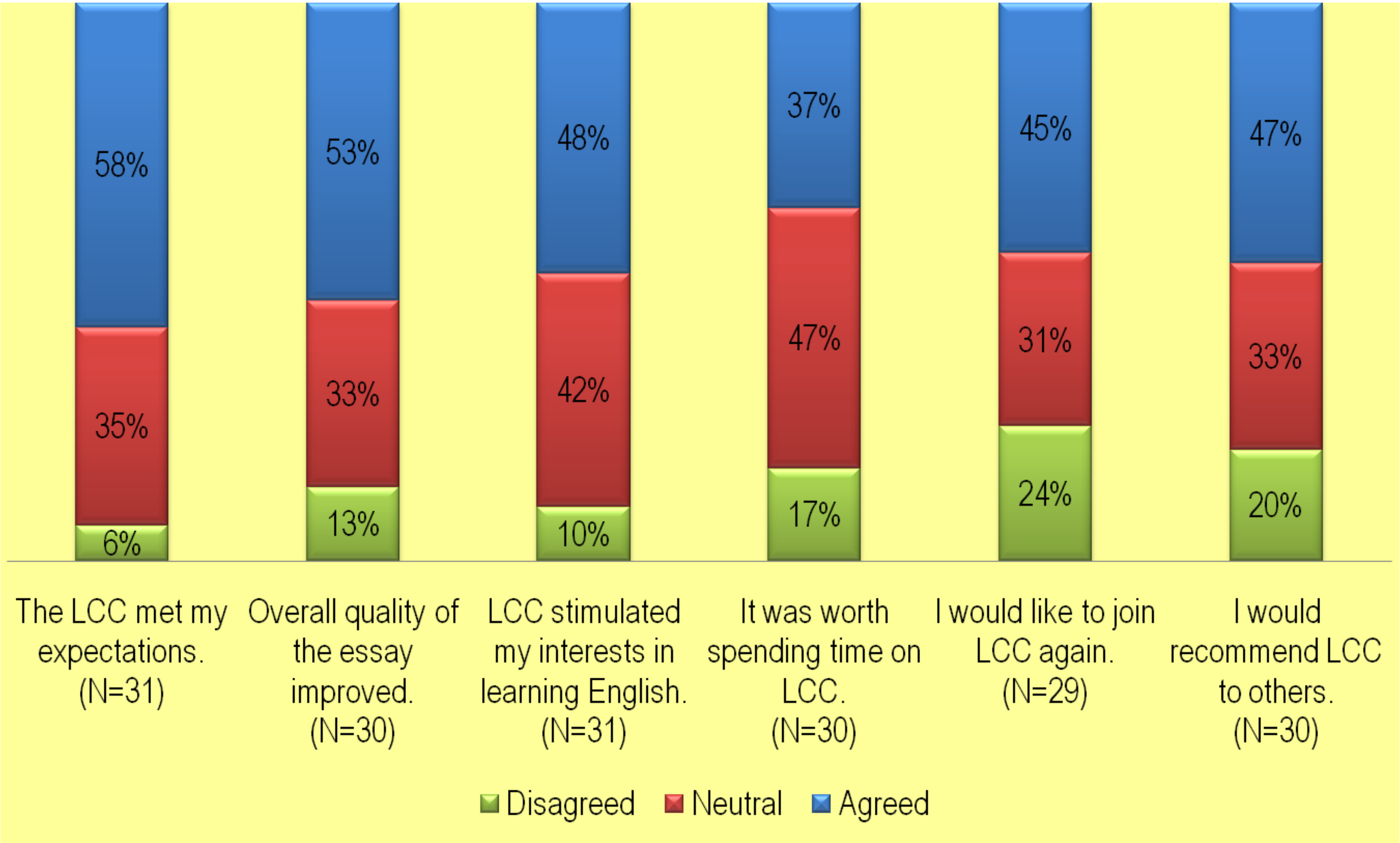
Common Errors found in EE3003 Progress Reports

	Ass#1 Version 1		Ass#1 Version 2	
	Comment type	Freq	Comment type	Freq
1	Article missing	265	Delete this (unnecessary)	96
2	Delete this (unnecessary)	257	Article missing	72
3	Word choice - Collocation	141	Punctuation – missing	53
4	Verb - past simple	126	Word choice - Collocation	44
5	Noun - countable	113	Verb - bare infinitive	37
6	Punctuation – missing	110	Verb - past simple	37
7	Preposition - wrong use	89	Informal language - Personal pronouns	34
8	Spelling	78	Preposition - wrong use	32
9	Punctuation - capitalisation	71	Informal language - Bullet points	31
10	Verb - present simple	66	Word order	29
11	Word order	55	Noun- Countable	25

Outcome – EE3003

Assignments	Error rate for students who have submitted once	Error rate for students who have submitted twice	
		Draft 1	Draft 2
1st essay (progress report)	6.95	7.21	5.02
2nd essay (final report)	3.88	3.73	3.09

Overall satisfaction (EE2170)



Reflections

The new TLAs and TAs can provide

- a platform for the laboratory supervisors to closely monitor the learning progress of the students; and
- means to assess the performance of individual student and success of the student groups.
- students with more opportunities to write and improve their writing skills with the support of LCC

Summary

- We have introduced the OBTL framework in EE which assists in aligning teaching, learning and assessment with ILOs.
- This framework aims to give a good balance between the Quality Monitoring at Programme Level and the liberty of individual staffs to enhance students' learning.
- Two courses are selected to demonstrate how TLAs and ATs are aligned at CILOs and PILOs level. And the corresponding learning outcomes have been discussed briefly.

Thank You