Undergraduate Mathematics program
Professor Cheung Kwok Cheung, FED, E33 Room 2016 (Ext 8738)

Coordinating Unit:	Department of Mathematics, Faculty of Science and Technology		
Supporting Unit(s):	Faculty of Education		
Course Code:	MAEB216	Year of Study:	2
Course Title:	Theories of curriculum and instruction (secondary mathematics) 課程與教學論 (中學數學)		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	Nil		
Prerequisite Knowledge:	Nil		
Duration:	One semester	Credit Units:	3
Class/Laboratory Schedule:	Three hours of lecture cum group tutorial per week (14 weeks)		
Laboratory/Software Usage:	Nil		
Course Description:	Focusing on secondary mathematics basic education, this course introduces participants fundamental knowledge and principles of curriculum and instruction, covering: (1) determining clearly-articulated teaching objectives; (2) selecting and organizing curriculum contents and materials; (3) implementing the mathematics curriculum with idealistic educational aims; (4) improving effectiveness of teaching tasks and understanding how to carry them out professionally in local contexts. It seeks to put fundamental principles into effective practice in contemporary mathematics classrooms. Under the guidance of innovative instructional models, strategies and methods, this course seeks to empower participants become curriculum decision makers and implementer, participants are able to design educationally appropriate learning environments and engage with students highly in the learning processes.		
Course Objectives:	Course participants are second year pre-service students. This course is the first mathematics education course for the preparation of their teaching career. Hence, this course seeks to introduce them practices of mathematics curriculum and instruction in Macao, Chinese Mainland, as well as those that have a bearing with Macao so that they have an overview of contemporary mathematics education in the 21st Century. Another major objective is to help them link theory and practice so that they know about how to design a good lesson and teach it well in the mathematics classroom.		
Learning Outcomes (LOs):	At the completion of the course, course participants: 1. Get acquainted with theories and principles of learning mathematics, teaching and evaluation recommendations; 2. Know based on what principles and rationales the mathematics textbooks are designed, and how the contents are arranged across grades in accordance with promulgated mathematics standards; 3. Able to plan mathematical investigation, with a focus on mathematical modelling, mathematical culture, and mathematical literacy		

Texts & References:	1. 張奠宙、李士錡、李俊 (編著)(2003) 。數學教育學導論。高等教育出版社。 2. 孔企平、張維忠、黃榮金 (編著)(2003) 。數學新課程與數學學習。高等教育出版社。 3. 馬复 (編著)(2003) 。設計合理的數學教學。高等教育出版社。 4. 詹勳國等譯(2000) 。 數學的學習與教學：六歲到十八歲，台北：心理。[Nickson, M. (2004). Teaching and Learning Mathematics: A Teacher's Guide to Recent Research and its Application. Psychological Publishing.] 5. 張靜譽、念家興譯(2001) 。數學教學方法，台北：九章。[Sobel, M.A., & Maletsky, E.M. (1988). Teaching Mathematics: A Sourcebook of Aids, Activities, and Strategies. Prentice Hall.]
Student Assessment:	• Assignments: 20% • Group projects and class presentations: 30% • Final examination: 50%
Learning Outcome Assessment:	• Homework, projects, and open-book final examination

Pedagogical Methods:	☑ Lecture	☐ Service learning
	☐ Guest speakers	☐ Internship
	☑ Case study	☐ Field study
	☐ Role playing	☐ Company visits
	☑ Student presentation	☑ e-learning
	☑ Project	☐ Independent study
	☐ Simulation game	☐ Others: _____
	☑ Exercises and problems	

Major Assessment Methods:	Case Study	Role Playing	Student Presentation	Individual project/paper	Group project/paper	Simulation Game	Exercises & problems	Service learning	Internship	Field Study	Company visits	Written examination	Oral examination	Others (please specify)
Class Participation/ Discussion (0%)														
Assignments (20%)							✓							

Projects (30%)	✓		✓		✓									
Midterm Exam (0%)														
Final Exam (50%)												✓		
Others *(please specify)*														
Course Web: (if any)														

2014 Fall Calendar	Topics of Study (delivered also as a Moodle Course on the UM website) [Scheduled class to be replaced by group tutorial @ UM E33, Room 2008, at a time convenient to the various tutorial groups, which is to be announced in due course]*
25 Aug - 31 Aug 25 Aug [MON]* 28 Aug [THU] -- (First lesson of course)	This lesson aims at introducing: (1) basic information of secondary education in Macao; (2) history and evolution of mathematics and mathematics education in China. It is hoped that students can understand the background of the new Chinese Mathematics Curriculum Standards, and its impact on the current situation of secondary mathematics education in Macao. As an induction lesson, students watch the Disney video "Donald in the Mathemagic Land".
1 Sept - 7 Sept 1 Sept [MON]* 4 Sept [THU] *	This lesson aims at introducing: (1) the new junior secondary Chinese mathematics standards for use by schools in China in the 21st Century; (2) a comparison of mathematics education objectives in China and around the world. It is hoped that students can understand the curriculum reform rationale, learning contents, teaching and evaluation recommendations of the new Chinese mathematics standards, and the shortcomings of the New Maths Movement in the 1960-70s. Referencing some recommended resources on the web, students are guided to do an individual assignment on characteristics of Platonic Polyhedra. This assignment one is to be handed in the following week. [Replaced by group tutorials of Macao maths text books]
8 Sept - 14 Sept 8 Sept [MON] 11 Sept [THU]	This lesson aims at introducing the objectives of teaching space and figures in the junior secondary (stage 3) mathematics curriculum. Students watch a video-taped session on how to plan a lesson on the teaching of properties of spaces and figures. Referencing some recommended resources on the web, students are guided to do an individual assignment on Trisection of any Given Angle Problem. The assignment is to be handed in the following week.
15 Sept - 21 Sept 15 Sept [MON] 18 Sept [THU]	This lesson aims at introducing the primary and junior secondary Chinese mathematics curriculum standards, as well as the associated mathematics textbooks commonly used by secondary schools in Macao. Students are advised to form groups to analyze the contents of one set of these textbooks, so as to comprehend the organizing structure of the junior secondary school mathematics curriculum. The group projects are to be presented in front of the class in the following lesson.
22 Sept - 28 Sept 22 Sept [MON] 25 Sept [THU]	This lesson aims at rounding up public responses and opinions by the various stakeholders about the Chinese mathematics standards. Students will have a better idea of the decision making processes in the design of an official mathematics curriculum.
29 Sept - 5 Oct 29 Sept [MON] 2 Oct [THU]	This lesson aims at introducing the senior secondary Chinese mathematics curriculum standards, as well as the associated mathematics textbooks commonly used by secondary schools in Macao. Students are advised to form groups to analyze the contents of one set of these textbooks, so as to comprehend the organizing structure of the senior secondary school mathematics curriculum. The group projects are to be presented in front of the class in the following lesson.

6 Oct - 12 Oct 6 Oct [MON] 9 Oct [THU]	This is the seventh lesson of the course. Through analyzing the contents of a mathematics textbook, this lesson aims at familiarizing students with the new features of the senior secondary Chinese mathematics curriculum standards. Emphases are made on newly added topics of study, as well as deletion of the obsolete ones in teachers' everyday instruction.
13 Oct - 19 Oct 13 Oct [MON] 16 Oct [THU]	This lesson aims at giving some concrete examples on how elective topics may be added to the formal mathematics curriculum. Useful websites (e.g. 善科網) are introduced for students' project work. Videos (e.g. 生活中的數學曲線) are suggested to stimulate student's learning in mathematics special topics.
20 Oct - 26 Oct 20 Oct [MON] 23 Oct [THU]	This lesson aims at familiarizing students with writing of a lesson plan addressing the main and difficult points of a mathematics topic.
27 Oct - 2 Nov 27 Oct [MON] 30 Nov [THU]	This lesson aims at familiarizing students with writing of a lesson plan of a mathematical investigation. Inculcation of creativity in mathematics education is also paid attention when planning student activities.
3 Nov - 9 Nov 3 Nov [MON] 6 Nov [THU] *	This lesson aims at familiarizing students with Freudenthal's ideas of horizontal and vertical mathematization. Students are introduced on how to write a lesson plan of the open box problem. [Replaced by group tutorials of the lesson plan]
10 Nov - 16 Nov 10 Nov [MON]* 13 Nov [THU] *	This lesson aims at elucidating ideas of realistic mathematics education (RME). Students are encouraged to use every day encountered authentic problems as example contexts in their daily teaching. [Replaced by group tutorials of the lesson plan]
17 Nov - 23 Nov 17 Nov [MON] 20 Nov [THU]	This lesson aims at examining the lesson plans of the open-box problem used in classroom settings.
24 Nov - 30 Nov 24 Nov [MON] 27 Nov [THU] -- (Last lesson of course)	This is the last lesson of the course. This lesson aims at introducing the PISA mathematics literacy assessment framework. Released items are used to illustrate how the PISA mathematical literacy continuum are conceptualized and scaled for comparative education purposes.

Homework & Projects:

Week no.	Topics	Assignment no.	LO no.
2	Defining characteristics of a Platonic Polyhedra	Homework 1	1
3	Trisection of any given angle	Homework 2	1
4	An examination of a set of junior secondary mathematics textbooks used in Macao schools	Group Project 1	2
5	Model making: Platonic Polyhedra	Homework 3	3
8	An examination of a set of senior secondary mathematics textbook used in Macao schools	Group Project 2	2
10	Tessellation of quadrilaterals and creative art design	Homework 4	3
12	Lesson plan of a mathematical investigation	Homework 5	3

STUDENT DISABILITIES SUPPORT SERVICE

The University of Macau is committed to providing an equal opportunity in education to persons with disabilities. If you are a student with a physical, visual, hearing, speech, learning or psychological impairment(s) which substantially limit your learning and/or activities of daily living, you are encouraged to communicate with your instructors about your impairment(s) and the accommodations you need in your studies. You are also encouraged to contact the Student Disability Support Service of the Student Counselling and Development Section (SCD), which provides appropriate resources and accommodations to allow each student with a disability to have an equal opportunity in education, university life activities and services at the University of Macau. To learn more about the service, please contact SCD at scd.disability@umac.mo, or 8397 4901 or visit the following website: http://www.umac.mo/sao/scd/sds/aboutus/en/scd_mission.php