

**University of Macau**  
**Undergraduate Civil Engineering Programme**

Coordinating Unit:	Department of Civil and Environmental Engineering, Faculty of Science and Technology		
Supporting Unit(s):	Nil		
Course Code:	CIVL360	Year of Study:	3
Course Title:	Surveying		
Compulsory/Elective:	Compulsory		
Course Prerequisites:			
Prerequisite Knowledge:			
Duration:	One semester	Credit Units:	3.5
Class/Laboratory Schedule:	Two hours of lecture and four hours of practice.		
Laboratory/Software Usage:			
Course Description:	This course covers the following topics: distance measurement, leveling, angle measurement, surveying errors and adjustments, field operations, traverse, construction surveying, curve measurement, measurement of area and volume, topography.		
Course Objectives:	<ol style="list-style-type: none"> <li>1. To introduce to students the theory and application of surveying.</li> <li>2. To make students well understand the fundamentals of surveying knowledge and being familiar with various aspects of surveying practice.</li> <li>3. Train the students to work in the field with the knowledge learned in classroom.</li> </ol>		
Learning Outcomes (LO):	<p>Upon completion of this course, students should be able to:</p> <ol style="list-style-type: none"> <li>1. master the fundamental knowledge about distance measurement, leveling, angle measurement, surveying errors and adjustments [POs: a,b];</li> <li>2. know how to use the instruments to measure distance, angles, and elevations [POs: e,k];</li> <li>3. apply the fundamental knowledge in the field to work on some small projects which need all the knowledge learned in this course [POs: a,b,e];</li> <li>4. work closely in a team for finishing a project in the field [POs: e,g];</li> <li>5. complete the paper work correctly based on the data collected in the field [POs: b,e,g].</li> </ol>		
Texts & References: <i>(* recommended textbook(s))</i>	<ol style="list-style-type: none"> <li>1. Charles D.G. and Paul R.W. (2008), Elementary Surveying, 12<sup>th</sup> ed., Pearson Education International.</li> <li>2. Arthur R., Benton Jr., and Taetz P.J. (1991), Elements of Plane Surveying, McGraw-Hill, International Edition.</li> <li>3. Anderson J. M. and Mikhail E. M. (2000), Surveying: Theory and Practice, 7<sup>th</sup> ed. McGraw-Hill, international edition, US.</li> </ol>		
Student Assessment:	<ul style="list-style-type: none"> <li>• Assignments: 20%</li> <li>• Practices: 40%</li> <li>• One test: 30%;</li> <li>• Final course project: 10%</li> </ul>		
Learning Outcome Assessment:	<ul style="list-style-type: none"> <li>• Assignments, practices, test, and final course project.</li> </ul>		
Pedagogical Methods:	<input checked="" type="checkbox"/> Lecture <span style="margin-left: 200px;"><input type="checkbox"/> Service learning</span> <input type="checkbox"/> Guest speakers <span style="margin-left: 200px;"><input type="checkbox"/> Internship</span>		

<input checked="" type="checkbox"/> Case study <input type="checkbox"/> Role playing <input type="checkbox"/> Student presentation <input checked="" type="checkbox"/> Project <input type="checkbox"/> Simulation game <input checked="" type="checkbox"/> Exercises and problems	<input checked="" type="checkbox"/> Field study <input type="checkbox"/> Company visits <input type="checkbox"/> e-learning <input checked="" type="checkbox"/> Independent study <input type="checkbox"/> Others: <u>Computer software Lab.</u>
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Major Assessment Methods: For each Major Assessment Method below, please indicate the specific pedagogical methods involved (by putting a ✓ in the relevant box(es) on the right-hand side).	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%)														
Assignment(s) (20%)							✓							
Test(s) (30%)												✓		
Practices (40%)					✓									
Others (please specify) Final course project (10 %)					✓									
Course Web: (if any)	Course materials are available in UMMoodle ( <a href="http://webcourse.umac.mo/">http://webcourse.umac.mo/</a> ).													

Course Content: (topic outline)	Week no.	Topics	Assignment no.	LO no.
	1	<b>Distances</b> Distance measurement; steel tapes and taping equipment; use of steel tapes in the field; reduction of slope distance; correction for tape length, tension, temperature change, and sag; correction for offset; application of combined tape corrections.	1	1-5
	2	<b>Electronic Distance Measurement</b> Applications of EDM; EDM theory; atmospheric effects; EDM errors; use of the EDM (TS) in the field	2	1-5
	3,4	<b>Leveling</b> The applications of leveling; terms in leveling; earth curvature and refraction; trigonometric leveling; differential leveling: concept and terminology; differential leveling instruments and point-to-point procedure; loop leveling procedures and computation; leveling errors; three-wire levels; reciprocal levels; profile levels; laser levels	3,4	1-5
	5	<b>Angle Measurement</b> Angle terminology; horizontal angles from horizontal distances; instruments for angle measurement; measuring horizontal angles; improving angle measurement; measurement error; measuring vertical angles; resources of measurement errors	5,6	1-5
	6	<b>Surveying Errors and Adjustments</b> Random-error concepts; rejection Limit; standard error of the function of measurement; weighting; adjustment versus standard error	7	3-5
	7	<b>Field Operations</b> Horizontal-angle convention and procedures; laying out angles; straight-line extension; obstacle on line; balance in; random Line	8	3-5
	8	<b>Directions</b> Meridians, azimuths, and bearings; direction computation and checking; magnetic north and declination; conversion between true north and magnetic north; magnetic disturbances	9	3-5
	9	<b>Traverse</b> Angle closure and balancing; latitude and departure; closure and precision; compass rule and adjustment; coordinate determination; procedures of traverse computation; area computation	10	3-5
	10	<b>Construction Surveying</b> Foundation layout; setting and leveling forms; building leveling control; building vertical control; pipeline grade control; highway grade control	11	3-5
	11	<b>Measurement for Area and Volume</b> Horizontal area measurement; area measurement of a profile; volume computation with measured data	12	3-5

Contribution to Program Outcomes:	Program Outcomes	Contribution to POs <sup>#</sup>				
		5 -----> 1				
		5 Significant	4	3	2	1 Least
	(a) apply knowledge of mathematics, science, and engineering			✓		
	(b) design and conduct experiments, and analyze data	✓				
	(c) design components, systems or processes in presence of constraints					
	(d) Function in a multi-disciplinary team					
	(e) Engineering problem solving	✓				
	(f) Understand professional and ethical responsibility					
	(g) Communicate effectively			✓		
	(h) Understand the impact of engineering solutions to the society					
	(i) Recognize the need and have the ability for lifelong learning					
	(j) Have knowledge of contemporary issues					
	(k) Apply the skills, techniques, modern engineering tools		✓			
	(l) Use the computer/IT tools relevant to the discipline					
	# Note 5: Significant contribution; 4: Supporting contribution; 3: Moderate contribution; 2: Marginal support; 1: Least support					
Course Instructor(s):	Prof. Guokang Er					