



Undergraduate

Program

Course Title Penetration Testing and Prevention

Mahidol University International College

Course Code EGCI 477

Division Science

### TQF 3 Course Specifications

#### Section 1 General Information

##### 1. Course code and course

title

Thai EGCI 477 การทดสอบเจาะระบบและการป้องกัน

English EGCI 477 Penetration Testing and Prevention

##### 2. Number of credits 4 Credits

##### 3. Program and type of subject

3.1 Program Bachelor of Engineering (Computer Engineering)

3.2 Type of Subject Major Course (Required Major)

##### 4. Course Coordinator and Course Lecturer

4.1 Course Coordinator Asst. Prof. Lalita Narupiyakul, Ph.D.

4.2 Course Lecturer Assoc. Prof. Suratose Tritilanunt, Ph.D.

##### 5. Trimester/ Year of Study

5.1 Trimester Third trimester / for 4<sup>th</sup> year Computer Engineering

5.2 Course Capacity Approximately 25 students

6. Pre-requisite EGCI 371 Computer Networks and Information Security

7. Co-requisites None

**8.** Venue of Study Mahidol University, Salaya campus



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## Section 2 Goals and Objectives

### 1. Course Goals

To develop student in the basic principle of penetration testing and prevention on network system and web application. The technique to analyze vulnerabilities and threats in the system and web application will be explained in the classroom. Students will also learn the ethics of penetration testing processes. The explanation on how to design and troubleshoot security mechanism to prevent threats in computer network and web application will be discussed and exercised by using lab experiments and class assignments. These lab exercises will help students clearly understand this course and be able to use their skill and knowledge to solve simple engineering problems.

### 2. Objectives of Course Development/Revision

#### 2.1 Course Objectives

1. Explain basic principle of penetration testing and prevention.
2. Explain the technique to analyze vulnerabilities and threats in the system and web application.
3. Design and troubleshoot security mechanism to prevent threats in computer network and web application.

#### 2.2 Course-level Learning Outcomes: CLOs

By the end of the course, students will be able to (CLOs)

1. CLO1 Analyze system and web application vulnerability problems that exists in the system
2. CLO2 Show ability to work as team by presenting knowledge resulting from studies or experiments in a written report systematically.



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### Section 3 Course Management

#### 1. Course Description

(Thai) กระบวนการทดสอบการเจาะระบบ การรวบรวมและวิเคราะห์ ภาวะเสี่ยงสูงในเครือข่ายคอมพิวเตอร์ เครื่องมือเพื่อการทดสอบการเจาะระบบ จริยธรรมของกระบวนการทดสอบการเจาะระบบ การสรุปและรายงานผล การทดสอบ การเจาะระบบ การวางแผนและออกแบบระบบป้องกันเพื่อรักษาเครือข่ายคอมพิวเตอร์จากภาวะเสี่ยงสูง

(English) The process of penetration testing; collection and analysis of computer network vulnerabilities; tools for penetration testing; ethics of penetration testing processes; summarizing and reporting the result from the penetration testing; planning and designing of the prevention systems to protect the computer network form vulnerabilities

#### 2. Credit hours per trimester

Lecture (Hour(s))	Laboratory/field trip/internship (Hour(s))	Self-study (Hour(s))
48 hours (4 hours x 12 weeks)	-	96 hours (8 hours x 12 weeks)

#### 3. Number of hours that the lecturer provides individual counseling and guidance.

1 hours/week



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#### Section 4 Development of Students' Learning Outcome

1. Short summary on the knowledge or skills that the course intends to develop in students (CLOs)

By the end of the course, students will be able to

1. CLO1 Analyze system and web application vulnerability problems that exists in the system
2. CLO2 Show ability to work as team by presenting knowledge resulting from studies or experiments in a written report systematically.

2. Teaching methods for developing the knowledge or skills specified in item 1 and evaluation methods of the course learning outcomes

Course Code	Teaching methods	Evaluation Methods
CLO1	Interactive Lecture, Individual Assignment	Written Examination, Individual Evaluation
CLO2	Lab Exercise, Class Assignment	Lab Examination, Lab Exercise

#### Section 5 Teaching and Evaluation Plans



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1. Teaching plan

Week	Topic	Number of Hours		Teaching Activities/ Media	Lecturer
		Lecture Hours	Lab/Field Trip/Internship Hours		
1	Introduction to Penetration Testing and Information Gathering	4	0	Interactive Lecture, Individual Assignment, Lab Exercise	Interactive Lecture, Quiz1, Individual Assignment, Lab Exercise
2	System Vulnerability Scanning Techniques	4	0		
3-4	Windows System Exploitation and Privilege Escalation	8	0		
5-6	Linux System Exploitation and Privilege Escalation	8	0		
7	Examination	2	0		Midterm Assessment
7-8	Client-side Exploitation	6	0	Interactive Lecture, Individual Assignment, Lab Exercise	Quiz2, Individual Assignment
9-12	Web Application Testing and Prevention	14	0		
12	Examination	2	0		
	Total	48	0		



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## 2. Plan for Assessing Course Learning Outcomes

### 2.1 Assessing and Evaluating Learning Achievement

#### a. Formative Assessment

The assessment tools such as homework, quizzes and exam are used to evaluate student's understanding by their ability to explain the processes of penetration testing, as well as the techniques for analyzing vulnerabilities and threats in the system and web application. For the design and troubleshoot parts, students should be able to show how to examine any network vulnerabilities by using lab exercises provided in the classroom. These assessments are made through their homework, quizzes and exams.

#### b. Summative Assessment

##### (1) Tools and Percentage Weight in Assessment and Evaluation

Learning Outcomes	Assessment Methods	Assessment Ratio (Percentage)	
CLO1 Analyze system and web application vulnerability problems that exists in the system.	Quiz	10	80
	Lab Exercise	10	
	Midterm Exam	30	
	Final Exam	30	
CLO2 Show ability to work as team by presenting knowledge resulting from studies or experiments in a written report systematically.	Homework	10	20
	Lab Exercise	10	
Total			100



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(2) Grading System

Grade	Achievement	Final Score (% range)	GPA
A	Excellent	90-100	4.0
B+	Very Good	85-89	3.5
B	Good	80-84	3.0
C+	Fairly Good	75-79	2.5
C	Fair	70-74	2.0
D+	Poor	65-69	1.5
D	Very Poor	60-64	1.0
F	Fail	Less than 60	0.0

(3) Re-examination

N/A - (Not applicable with MUIC)

3. Student Appeals

The student wishing to appeal according to grading result must submit a written and signed appeal form personally to the academic affair unit. It is prohibited to assign another person to appeal on one's behalf. The written appeal form is then sent to the program director and chair of department. The final decision is transferred for approval by the faculty committee. The result of appeal then is informed to the student.



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### Section 6 Teaching Materials and Resources

#### 1. Textbooks and/or other documents/materials

- 1) Carlos A. Lozano, Dhruv Shah, Riyaz Ahemed Walikar, “Hands-On Application Penetration Testing with Burp Suite”, 1st edition, Packt Publishing, February 2019.
- 2) Alexis Ahmed, “Privilege Escalation Techniques”, 1st edition, November 2021.
- 3) Himanshu Sharma, “Kali Linux - An Ethical Hacker's Cookbook: End-to-end penetration testing solutions”, Packt Publishing, 2017.

#### 2. Recommended textbooks and/or other documents/materials

- 1) Dafydd Stuttard, and Marcus Pinto, “The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws”, Wiley, 2nd edition, 2011.

#### 3. Other Resources (If any)

Websites – To be Announced in class



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## Section 7 Evaluation and Improvement of Course Management

### 1. Strategies for effective course evaluation by students

1.1 Evaluation of peers by students

1.2 Student evaluation

1.2.1 Course content

1.2.2 Course management

1.2.3 Suggestions

1.2.4 Overall opinions

### 2. Evaluation strategies in teaching methods

2.1 Student evaluation

2.2 Presentation

### 3. Improvement of teaching methods

Use evaluation from 1 and 2 for course improvement

### 4. Evaluation of students' learning outcome

Analysis of students' learning outcomes using scores from each CLOs for evaluation.

### 5. Review and improvement for better outcome

Review the course before trimester starts, before each teaching period and review course contents every 3 years.



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Appendix

Alignment between Courses and General Education courses

Relations between the course and the program

**Table 1** Relations between the course and the PLOs

Penetration Testing and Prevention	PLOs					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
EGCI 477			R		R	

**Table 2** Relations between CLOs and PLOs

EGCI 477	PLOs					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1 Analyze system and web application vulnerability problems that exists in the system.			x			
CLO2 Show ability to work as team by presenting knowledge resulting from studies or experiments in a written report systematically.					x	



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**Table 3** PLOs that the course is responsible for

<i>PLOs</i>	<i>SubPLOs</i>
PLO3: Evaluate the computer requirements and identify the appropriate knowledge and tools for effective problem solving in computer	3.1 Analyze problems that exists in computer system
PLO5: Perform good communication skills with various groups of people and demonstrate self and team responsibility.	5.2 Present knowledge resulting from studies or experiments in a written report systematically