

Course Syllabus

1. **Course Name** Calculus and Systems of Ordinary Differential Equations
(International Programme)
- Faculty/Institute/College** Department of Mathematics,
Faculty of Science, Mahidol University
2. **Course Code** SCMA 174
3. **Number of Credits** 3(3-0-6) credits (Lecture-Practical-Tutorial)
4. **Prerequisite** None
5. **Session** Semester 1, Academic Year 2023
6. **Date/Time** Wednesday 9:00 – 12:00 PM & Room. SC1-152

7. Course Description

Review of calculus, chain rule and derivatives of inverse functions, derivatives of trigonometric, inverse trigonometric, exponential and logarithmic functions, implicit differentiation, related rates, L'Hospital Rules and applications of derivatives, antiderivatives, definite and indefinite integrals, fundamental theorems of calculus, techniques of integration, applications of integration, systems of ordinary differential equations, direction fields and phase portraits, matrix representation, stationary solutions, solutions by Eigenvalue method, applications of systems of ordinary differential equations.

8. Course Outline

Week	Topics	Lecture (hours)	Lab (hours)	Instructor
1	Review of calculus, chain rule and derivatives of inverse functions	3		Asst. Prof. Dr. Umaporn Nuntaplook
2	Derivatives of trigonometric functions and inverse trigonometric functions	3		
3	Exponential and logarithmic functions, implicit differentiation	3		

4	Related rates, L'Hospital Rules and applications of derivatives	3		
5	Antiderivatives, definite and indefinite integrals, fundamental theorems of calculus, techniques of integration: -Substitution Technique -Substitution by Trigonometric functions	3		
6	Techniques of integration: - Integration by parts - Partial fraction decomposition	3		
7	Improper Integration	3		
8	Applications of integration	3		
9	Midterm Examination			
10	Ordinary differential equations, Solutions and Initial Value Problems	3		
11	Separable equations and Linear equations	3		
12	Linear system of ordinary differential equations, basic theory, linearly independent/dependent, Wronskian, matrix representation	3		
13	Direction fields and phase portraits, equilibrium point and equilibrium solutions	3		
14	Homogeneous linear systems, stationary solutions;	3		

	Solutions by eigenvalue and eigenvector methods			
15	Nonhomogeneous linear systems - variation of parameters Introductory to autonomous equation	3		
16	Phase portraits and stability of system of linear equations	3		
17	Final Examination			

Note: The agenda may be changed based on the progression of the course.

9. Teaching Methods

Lectures, Class discussion, Problems solving, Assignments, Self-study.

10. Teaching Media

Lecture notes, practice exercises, and distributed sheets.

All handouts and past lectures will be posted on Google Classroom name 'SCMA174 Year 2023'

Class link: <https://classroom.google.com/c/NjE2NjE5NDM4NzE4?cjc=o2fdbyy>

Class code: o2fdbyy

11. Measurement and Evaluation of Student Achievement

Evaluate students' achievement from ability to understand and apply the principles of differentiation, integration, ordinary differential equations, and systems of ordinary differential equations.

Evaluation and achievement will be justified according to the Faculty and University code, with the grading system of A, B⁺, B, C⁺, C, D⁺, D, and F, based on grading system of students' performance on the followings:

- Midterm examination	40%
- Assignments	20%
- Final examination	40%
Total	100%

Percentage	Grade
80 - 100	A
75 - 79	B+
70 - 74	B
60 - 69	C+
50 - 59	C
40 - 49	D+
35 - 39	D
0 - 34	F

12. Course Evaluation

Evaluate as indicated in number 11 above.

13. References

1. Neuhauser C. Calculus for biology and medicine. 2nd ed. Upper Saddle River, N.J.: Prentice Hall; 2004.
2. Zill DG, Cullen MR. Differential equations. 6th ed. Thomson; 2005.
3. Stewart J. Calculus. 5th ed. Thomson; 2003.

14. Instructor

Asst. Prof. Dr. Umaporn Nuntaplook

Office room: B226

Department of Mathematics, Faculty of Science, Mahidol University

Tel. 02-201-5441

Email address: umaporn.nun@mahidol.ac.th