# 课程大纲
# COURSE SYLLABUS

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| **1.** | **课程代码/名称**<br>**Course Code/Title** | MAT7069 偏微分方程（下）<br>MAT7069 PDE II |
| **2.** | **课程性质**<br>**Compulsory/Elective** | **选修 elective** |
| **3.** | **课程学分/学时**<br>**Course Credit/Hours** | 3 |
| **4.** | **授课语言**<br>**Teaching Language** | 英文<br>English |
| **5.** | **授课教师**<br>**Instructor(s)** | 苏琳琳助理教授<br>Assistant Prof. Linlin Su |
| **6.** | **是否面向本科生开放**<br>**Open to undergraduates or not** | 是 yes |
| **7.** | **先修要求**<br>**Pre-requisites** | 本科课程：MA303 偏微分方程，MA301 实变函数，MA302 泛函分析<br>Undergraduate courses: PDE, Real Analysis (Lebesgue theory), Functional Analysis |

**8. 教学目标**
**Course Objectives**

（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

以介绍偏微分方程的基本理论和方法为主并结合该领域的科研前沿介绍一些具有应用背景的例子.
The main part of this course consists the basic theories and methods of partial differential equations. Some examples with application background from the research frontier in this field will also be introduced.

**9. 教学方法**
**Teaching Methods**

（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

以板书教学为主.
Mainly blackboard-chalk teaching.

**10. 教学内容**
**Course Contents**
（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

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| **Section 1** | A brief introduction to **elliptic** interior and global regularity theories, the $L^p$ and Schauder estimates |
| **Section 2** | $L^2$ theory for 2nd order **parabolic** equations, existence via Galerkin method, uniqueness and regularity via energy method |
| **Section 3** | $L^2$ theory for 2nd order **hyperbolic** equations, existence via Galerkin method, uniqueness and regularity via energy method |
| **Section 4** | Nonlinear elliptic equations, variational method—the direct minimization method, method of upper and lower solutions, fixed point method |
| **Section 5** | Nonlinear parabolic equations, global existence, stability of steady states, traveling wave solutions |

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| | **Section 6** | Conservation laws, Rankine-Hugoniot jump condition, uniqueness issue, vanishing viscosity method, entropy condition, Riemann problem for Burger's equation |
| | **Section 7** | |
| | **Section 8** | |
| | **Section 9** | |
| | **Section 10** | |
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**11. 课程考核**
**Course Assessment**

（①考核形式 Form of examination；②.分数构成 grading policy；③如面向本科生开放，请注明区分内容。If the course is open to undergraduates, please indicate the difference.）

The semester grade will be given according to performance in homework (40%), midterm (20%), and the final exam (40%).

**12. 教材及其它参考资料**
**Textbook and Supplementary Readings**

Textbook: Partial Differential Equations, 2nd edition (reprint of 2015), by Lawrence C. Evans.
References:
1. Elliptic and Parabolic Equations, by Wu Zhuoqun, Yin Jinxue and Wang Chunpeng, World Scientific Publishing Co.
2. Elliptic Partial Differential Equations of second Order, by David Gilbarg and Neil S. Trudinger, Springer.
3. Partial Differential Equations, 2nd edition, by Robert C. McOwen, Prentice-Hall.
4. Maximum Principles in Differential Equations, by Murray H. Protter and Hans F. Weinberger, Springer.