

# 课程大纲

## COURSE SYLLABUS

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| 1.  | <b>课程代码/名称</b><br><b>Course Code/Title</b>               | 高级分布式系统 <b>Advanced Distributed Systems</b>  |
| 2.  | <b>课程性质</b><br><b>Compulsory/Elective</b>                | 专业选修课  |
| 3.  | <b>开课单位</b><br><b>Offering Dept.</b>                     | 计算机科学与工程系 / Department of Computer Science and Engineering   |
| 4.  | <b>课程学分/学时</b><br><b>Course Credit/Hours</b>             | 3 / 64   |
| 5.  | <b>授课语言</b><br><b>Teaching Language</b>                  | 英文 / English   |
| 6.  | <b>授课教师</b><br><b>Instructor(s)</b>                      | 李卓钊 / Zhuozhao Li  |
| 7.  | <b>开课学期</b><br><b>Semester</b>                           | 秋季 / Fall  |
| 8.  | <b>是否面向本科生开放</b><br><b>Open to undergraduates or not</b> | 是 / Yes  |
| 9.  | <b>先修要求</b><br><b>Pre-requisites</b>                     | <p>(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.)</p> <p>CS302 计算机操作系统 / CS302 Operating Systems<br/>CS305 计算机网络 / CS305 Computer Networks</p>  |
| 10. | <b>教学目标</b><br><b>Course Objectives</b>                  | <p>(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.)</p> <p>本课程涵盖与分布式系统的设计和实现相关的主题, 包括并行和分布式系统的基本概念、模型和实现、网络编程、命名、并发和锁定、一致性模型、容错、共识、云计算等。</p> <p>完成本课程后, 学生应能够:</p> <ol style="list-style-type: none"> <li>1. 了解分布式系统设计和实现的基础理论。</li> <li>2. 设计并实现满足各种应用场景需求的分布式系统。</li> <li>3. 熟练使用至少一种分布式编程模型, 并熟悉其他几种技术。</li> <li>4. 合理地讨论各种分布式系统的利弊, 并评估性能瓶颈。</li> </ol> <p>This course covers a broad range of topics related to the design and implementation of distributed systems, including the basic concepts, models, and implementations of parallel and distributed systems, network programming, naming, concurrency and locking, consistency models, fault tolerance, consensus, cloud computing, and more.</p> <p>Upon completion of this course, the students should be able to:</p> <ol style="list-style-type: none"> <li>1. Understand the fundamentals of distributed system design and implementation.</li> <li>2. Design and implement distributed systems that can satisfy the requirements of various application scenarios.</li> <li>3. Become proficient in using at least one distributed programming paradigm, and familiar with several others.</li> <li>4. Properly discuss the pros and cons, and evaluate the performance bottlenecks of distributed systems.</li> </ol> |
| 11. | <b>教学方法</b><br><b>Teaching Methods</b>                   |  |

(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.)

This course consists of lectures, labs, projects, and paper reading and presentations.

**12. 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.)

|                   |  |
|-------------------|--|
| <b>Section 1</b>  | Course Overview                                  |
| <b>Section 2</b>  | Distributed Architectures                        |
| <b>Section 3</b>  | Network communication and Remote Procedure Calls |
| <b>Section 4</b>  | Time and Logical Clocks                          |
| <b>Section 5</b>  | Eventual Consistency I                           |
| <b>Section 6</b>  | Eventual Consistency II                          |
| <b>Section 7</b>  | Fault Tolerance and Consensus I                  |
| <b>Section 8</b>  | Fault Tolerance and Consensus II                 |
| <b>Section 9</b>  | Scalable Causal Consistency                      |
| <b>Section 10</b> | Concurrency Control                              |
| <b>Section 11</b> | Distributed Transactions                         |
| <b>Section 12</b> | System Performance                               |
| <b>Section 13</b> | Case Studies: Cloud Computing                    |
| <b>Section 14</b> | Case Studies: Big Data Processing                |
| <b>Section 15</b> | Paper Presentation I                             |
| <b>Section 16</b> | Paper Presentation II                            |

**13. 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.)

Paper Presentations 10%  
 Assignments 50%  
 Final Exam 40%

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

Distributed Systems, 3rd Edition, M. van Steen and A.S. Tanenbaum, 2017

Distributed Systems: Concepts and Design, 5th Edition, George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair.

Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Kai Hwang, Jack Dongarra, and Geoffrey C. Fox, Morgan Kaufmann.

Reading materials: relevant research papers