课程编号 课程名称

1. 课堂讲授学时 **Lecture Hours：32**
2. 课堂实验学时 **Laboratory Hours**
3. 课下研讨学时 **Colloquia Hours**
4. 学生课下投入学时 **Individual Study Hours**
5. 学分 **Credits**
6. 开课学年学期（如果有强制性的要求则必须填，否则可以不填）**Occurrence：1st year, 2nd year, 3rd year, 4th year; Autumn, Spring**
7. 先修课程 **Prerequisite(s):** 必须先修的课程直接写课程编号和课程名称，建议先修的课程在课程名称后用*号标注，并在下一行注明：***Recommended, not required as prerequisite**
8. 课程概要 **Course Description:** 100 字以内，学习内容以学术关键词出现。
9. 课程预期学习成果 **Course Outcomes:** 用数字 1 到 9 列出每一项主要学习成果
10. 教学内容与学时分配 **Course Content, Laboratories and Laboratory Hours（有则填，没有则不填），Colloquia Hours（有则填，没有则不填）：**各章节目录与学时，实验内容与学时，研讨内容与学时

11. 考核与成绩评定 **Grading:**

Prerequisite quiz: xx%
Homework: xx%
Inclass Quizzes: xx%
Group Presentation: xx%
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12. 教材，参考书 **Text & Reference Book:** 作者，书名，版本，年份，国际标准书号 ISBN
13. 编写教师 **Course Lecturer：**

编写教师 **Course Lecturer**（签字）：

附录：英文课程教学大纲模板

附录：

Frontiers in Semiconductor Light Emission and Solid-State Lasers

1. 课堂讲授学时 Lecture Hours: 32
2. 课堂实验学时 Laboratory Hours: 0
3. 课下研讨学时 Colloquial Hours: 0
4. 学生课下投入学时 Individual Study Hours: 16
5. 学分 Credits: 2
6. 开课学年学期（如果有强制性的要求则 必须填， 否则可以不填） Occurrence: Summer Course
7. 先修课程 Prerequisite(s): College Physics* (*Recommended, not required as prerequisite)
8. 课程概要 Course Description: 100 字以内 ， 学习内容以学术 关键词出现。

   This course explores the fundamental principles and recent advances in semiconductor light-emitting devices and solid-state laser systems. Emphasis is placed on the interplay between material structure, electronic properties, and optical performance. Topics include radiative recombination mechanisms, quantum-confined structures, laser physics, device architectures, and emerging photonic materials. Students will engage with current literature and develop the ability to analyze and evaluate cutting-edge research..
9. 课程预期学习成果 Course Outcomes:

   By the end of successful completion of this course, the student will be able to:

   （1）Understand physical mechanisms of light emission in semiconductors
   （2）Analyze the structure–property relationships in optoelectronic materials
   （3）Explain the operating principles of solid-state lasers
   （4）Evaluate advanced device designs such as quantum wells, quantum dots, and nanostructures
   （5）Critically read and present recent research papers
   （6）Propose innovative ideas in semiconductor photonics
10. 教学内容与学时分配 Course Content, Laboratories and Laboratory Hours（有则填，没有则不填）, Colloquial Hours（有则填，没有则不填）；

    1. Fundamentals of Semiconductor Optoelectronics
       1) Band structure and optical transitions

2) Radiative and non-radiative recombination
3) Carrier dynamics and excitonic effects

2. Semiconductor Light-Emitting Devices
   1) Light-emitting diodes (LEDs)
   2) Laser diodes
   3) Efficiency limits and loss mechanisms
   4) Thermal and reliability issues
3. Quantum Structures and Nanoscale Emitters
   1) Quantum wells, wires, and dots
   2) Density of states engineering
   3) Single-photon sources and nanophotonics
4. Solid-State Laser Physics
   1) Laser fundamentals (gain, threshold, cavity design)
   2) Laser threshold condition, rate equations, laser characteristics
   3) Optical modes of a laser resonator, vertical modes, beam properties and coherence
5. Laser Heterostructures and Materials
   1) Semiconductor alloys, heterojunction, double heterostructure and separate confinement heterostructure laser
   2) Quantum wells and quantum well lasers
   3) Pseudomorphic heterostructures, quantum dots, QD lasers
6. Advanced Topics and Frontiers
   1) Perovskite and emerging optoelectronic materials
   2) Integrated photonics and on-chip lasers
   3) Quantum light sources and applications in quantum technologies
   4) Recent breakthroughs and research trends

11. 考核与成绩评定 Grading:

Class Participation Discussion: 20%;

Presentation: 80%.

12. 教材，参考书 Text & Reference Book:

13. 编写教师Course Lecturer: Fangze Liu

编写教师 Course Lecturer（签字）：