

## 课程大纲 COURSE SYLLABUS

1.	<b>课程代码/名称 Course Code/Title</b>	<b>Photonic materials and metamaterials/光学材料与超构材料 MSE5019</b>														
2.	<b>课程性质 Compulsory/Elective</b>	专业选修课 (Specialty Elective Course)														
3.	<b>课程学分/学时 Course Credit/Hours</b>	3 学分/48 学时														
4.	<b>授课语言 Teaching Language</b>	English														
5.	<b>授课教师 Instructor(s)</b>	李贵新														
6.	<b>是否面向本科生开放 Open to undergraduates or not</b>	是														
7.	<b>先修要求 Pre-requisites</b>	本科生：至少需修过 PHY103B 大学物理（上）B、PHY105B 大学物理（下）B；如果有修读过 PHY103A 大学物理（上）A、PHY105A 大学物理（下）A 或其他更高层次的课程也可以。 研究生：无														
8.	<b>教学目标 Course Objectives</b>	<p>This is an introduction into advanced topics in propagation of electromagnetic waves in a medium and interaction of electromagnetic waves with matter. Topics cover includes derivation of optical constants such as susceptibility and dielectric constants, photonic crystals, plasmonics and metamaterials.</p> <p>课程意义： 有助于学生了解光在材料中的传播机制，以及掌握利用光子晶体、等离激元共振、超构材料等人工微纳结构调控光传播的基础知识与技术。</p>														
9.	<b>教学方法 Teaching Methods</b>	Lectures and tutorials; 讲授和习题/辅导/讨论														
10.	<b>教学内容 Course Contents</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"><b>Section 1</b></td> <td>I. The Propagation of Light (Weeks: 1-3) 1.1 Introduction to Electromagnetism</td> </tr> <tr> <td><b>Section 2</b></td> <td>1.2 Maxwell's Equations</td> </tr> <tr> <td><b>Section 3</b></td> <td>1.3 Materials Equations</td> </tr> <tr> <td><b>Section 4</b></td> <td>1.4 Wave Equations</td> </tr> <tr> <td><b>Section 5</b></td> <td>1.5 Basic Properties of Electromagnetic Wave</td> </tr> <tr> <td><b>Section 6</b></td> <td>1.6 Optical Constants of Materials</td> </tr> <tr> <td><b>Section 7</b></td> <td>II. Polarization, Interference and Diffraction of Light (Weeks: 4-7) 2.1 Polarized Light</td> </tr> </table>	<b>Section 1</b>	I. The Propagation of Light (Weeks: 1-3) 1.1 Introduction to Electromagnetism	<b>Section 2</b>	1.2 Maxwell's Equations	<b>Section 3</b>	1.3 Materials Equations	<b>Section 4</b>	1.4 Wave Equations	<b>Section 5</b>	1.5 Basic Properties of Electromagnetic Wave	<b>Section 6</b>	1.6 Optical Constants of Materials	<b>Section 7</b>	II. Polarization, Interference and Diffraction of Light (Weeks: 4-7) 2.1 Polarized Light
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<b>Section 8</b>	2.2	Jones Vector and Matrix
<b>Section 9</b>	2.3	Fresnel Equations
<b>Section 10</b>	2.4	Coherence and Interference of Light
<b>Section 11</b>	2.5	Diffraction of Light
<b>Section 12</b>	2.6	Propagation of Light in Crystals
<b>Section 13</b>	2.7	Nonlinear Optics
<b>Section 14</b>	III.	Photonic Crystals (Weeks: 8-11)
	3.1	One Dimensional Photonic crystals
<b>Section 15</b>	3.2	Two Dimensional Photonic crystals
<b>Section 16</b>	3.3	Three Dimensional Photonic Crystals
<b>Section 17</b>	3.4	Fabrication of Photonic Crystals
<b>Section 18</b>	3.5	Applications of Photonic Crystals
<b>Section 19</b>	IV.	Plasmonics and Photonic Metamaterials (Weeks: 12-16)
	4.1	Localized and Surface Plasmon Resonances.
<b>Section 20</b>	4.2	Photonic Metamaterials
<b>Section 21</b>	4.3	Photonic Metasurfaces
<b>Section 22</b>	4.4	Fabrication of Metamaterials and Metasurfaces
<b>Section 23</b>	4.5	Applications of Plasmonic and Metamaterial devices.
<b>11.</b>	<b>课程考核</b> <b>Course Assessment</b>	
	Quiz/attendance: 10% Homework: 35% Project and presentation: 55%	
<b>12.</b>	<b>教材及其它参考资料</b> <b>Textbook and Supplementary Readings</b>	
	1. Introduction to Modern Optics, Grant R. Fowles. 2. Optical Metamaterials: Fundamentals and Applications, Cai Wenshan, Shalaev Vladimir.	