

## 课程大纲 COURSE SYLLABUS

1.	<b>课程代码/名称 Course Code/Title</b>	病毒生态与演化 <b>Virus Ecology and Evolution</b>
2.	<b>课程性质 Compulsory/Elective</b>	选修 Elective
3.	<b>课程学分/学时 Course Credit/Hours</b>	3 分 / 48 学时
4.	<b>授课语言 Teaching Language</b>	英语 English
5.	<b>授课教师 Instructor(s)</b>	范陆 FAN Lu
6.	<b>是否面向本科生开放 Open to undergraduates or not</b>	否 No
7.	<b>先修要求 Pre-requisites</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.) 无 No
8.	<b>教学目标 Course Objectives</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.) 能力方面: 具有自主学习的能力和终身学习的意识; 具有获取有关专业信息的能力, 掌握中外文资料查询、文献检索及运用现代信息技术获取和表达信息的基本方法; 具有不断学习和适应社会发展的能力。 知识方面: 系统掌握生命演化的基本理论、基本知识和基本技能, 了解演化学的知识体系和发展趋势; 了解演化假说的前沿发展现状和趋势。掌握一门外国语及基本的信息技术; 具备一定的人文和社会科学知识。 The students will gain the ability of self-motivated study for their life-time; they will be able to obtain international scientific experience, writing papers using modern information technology, and have the potential of continuous study and adaptation to the development of the society. They will master basic theories and skills of Evolution, understand the science at the biological frontiers, and trends in different evolutionary theories. They will develop skills in English as a foreign language, gain basic information and technology, and obtain certain background in humanities and social sciences.
9.	<b>教学方法 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.) 讲课、课堂测验、小组讨论、学生专题演讲 Lecture, Assignments, Group discussion, Presentation
10.	<b>教学内容 Course Contents</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.)
	<b>Section 1</b>	病毒的分类和多样性 Taxonomy and Diversity of Viruses <ul style="list-style-type: none"> <li>• 病毒种类 Types of viruses (2hr)</li> <li>• 病毒命名 Virus nomenclature (1hr)</li> <li>• 病毒分类系统 Taxonomic classification of viruses (1hr)</li> </ul>

	<ul style="list-style-type: none"> <li>非典型病毒形式 Untypical forms of viruses (1hr)</li> </ul>
<b>Section 2</b>	<p>早期复制子：起源与演化 Early Replicons: Origin and Evolution</p> <ul style="list-style-type: none"> <li>病毒起源的多种假说 Hypotheses in the origin of viruses (1hr)</li> <li>其他自私遗传元件 Other selfish genetic elements (1hr)</li> <li>病毒起源与细胞生命演化 Viral origin and the evolution of cellular life (2hr)</li> </ul>
<b>Section 3</b>	<p>病毒的遗传特征 Features of Viral Genetics</p> <ul style="list-style-type: none"> <li>病毒遗传物质 Genetic materials of viruses (1hr)</li> <li>病毒遗传信息流 Genetic information flow of viruses (1hr)</li> <li>病毒突变率 Mutation rate of viruses (2hr)</li> <li>病毒重组 Recombination of viruses (2hr)</li> <li>病毒的分子演化分析 Molecular evolutionary analysis of viruses (2hr)</li> </ul>
<b>Section 4</b>	<p>病毒“类物种”：动态、互作与致病性 Viral Quasispecies: Dynamics, Interactions, and Pathogenesis</p> <ul style="list-style-type: none"> <li>突变分布作为选择单元 Mutant distributions as the units of selection (1hr)</li> <li>适应性与病毒种群规模 Fitness and viral population size (2hr)</li> <li>环境改变中的适应性变化 Fitness variations in changing environments (1hr)</li> </ul>
<b>Section 5</b>	<p>宿主范围演化 Evolution of Host Range of Viruses</p> <ul style="list-style-type: none"> <li>病毒宿主范围 Host range of viruses (1hr)</li> <li>决定宿主范围的基因 Genes determining host range (1hr)</li> <li>跨宿主演化的突变与重组 Mutation and recombination in crossing host evolution (2hr)</li> </ul>
<b>Section 6</b>	<p>核酸聚合酶保真度与病毒种群适合度 Nucleic Acid Polymerase Fidelity and Viral Population Fitness</p> <ul style="list-style-type: none"> <li>聚合酶五步动力机制 Polymerase five-step kinetic mechanism (1hr)</li> <li>聚合酶功能的生化分析 Biochemical analysis of polymerase function (1hr)</li> <li>聚合酶保真度影响病毒种群适合度 Polymerase fidelity influences viral population fitness (1hr)</li> </ul>
<b>Section 7</b>	<p>病毒毒力的进化 Evolution of Virulence</p> <ul style="list-style-type: none"> <li>毒力的定义 The definition of virulence (1hr)</li> <li>毒力权衡假说 The trade-off hypothesis (1hr)</li> <li>毒力与适应性关系 Virulence and adaptation (1hr)</li> <li>毒力与宿主防御共同演化 Coevolution of virulence and host's defense (2hr)</li> <li>疫苗与毒力演化 Vaccine and the evolution of virulence (1hr)</li> </ul>

<b>Section 8</b>	病毒与全球生态系统 Viruses and Global Ecosystems <ul style="list-style-type: none"> <li>• 全球生物地化循环 Global biogeochemistry (1hr)</li> <li>• 病毒调节微生物种群 Viral regulation of microbial populations (1hr)</li> <li>• 病毒-宿主丰度模型 Viral-host abundance models (2hr)</li> <li>• 病毒在全球碳循环中的作用 Viral roles in global carbon cycling (1hr)</li> </ul>
<b>Section 9</b>	噬菌体治疗中的演化 Evolution in Phage Therapy <ul style="list-style-type: none"> <li>• 噬菌体治疗原理 Introduction of phage therapy (1hr)</li> <li>• 噬菌体与细菌宿主共演化 Coevolution of phages and bacterial hosts (2hr)</li> <li>• 噬菌体药物治疗挑战 Challenges in phage therapy (1hr)</li> </ul>
<b>Section 10</b>	内源性病毒元件 Endogenous Viral Elements (EVEs) <ul style="list-style-type: none"> <li>• EVE 类别 EVE classification (1hr)</li> <li>• EVE 识别方法 The identification of EVEs (1hr)</li> <li>• EVE 起源 The origin of EVEs (2hr)</li> <li>• EVE 的医学应用 Medical implications of EVEs (1hr)</li> </ul>
<b>11. 课程考核</b> <b>Course Assessment</b>	
(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.) ① 考察 ② 十三等级制 Letter Grading 课堂表现 (30%) + 课程作业 (70%) Performance in class (30%) + Assignments (70%)	
<b>12. 教材及其它参考资料</b> <b>Textbook and Supplementary Readings</b>	
Virus Evolution: Current Research and Future Directions. Scott C. Weaver, et al. 2016. Caister Academic Press. ISBN: 978-1910190234	