

复旦大学研究生课程教学大纲

课程名称/Course Title: 机械振动

课程代码/Course Code: FAET820005

任课教师/Instructor(s): 方虹斌

开课院系/School/Department: 086 工程与应用技术研究院

1. 课程概要/Course Summary			
课程名称（中文 Course Title（Chinese）	机械振动		
课程名称（英文） Course Title（English）	Mechanical Vibrations		
课程代码 Course Code	FAET820005	任课教师 Instructor(s)	方虹斌
开课院系 School/Department	086 工程与应用技术研究院	开课学期 semester	2023-2024学年 第一学期
授课语言 Teaching Language	中文	适用学科专业 Discipline/Specialization	
学分数 Course Credit(s)	3	教学周数 Weeks	共16周
总学时 Teaching Hours in Total	共54学时	实验/实践学时 Hours for Experiments/Practice	共0学时
预修课程要求 Pre-requisite Course(s)	理论力学（或工程力学），高等数学（或数学分析），线性代数（或高等代数）		
课程简介 Course Introduction	This course provides a thorough development of linear vibration theory for discrete and continuous systems. Unit 1 reviews analysis methods for single degree-of-freedom systems, which forms the basis for later units. Unit 2 presents Lagrange' s equations and Hamilton' s principle (Analytical Dynamics) sufficient for developing the equations of motion for discrete (Unit 3) and continuous (Unit 4) systems. Unit 3 presents vibration theory for discrete systems including the analysis and properties of the associated eigenvalue problem. Both undamped and damped systems will be considered. Unit 4 presents vibration theory for continuous systems with a focus on linear differential operator theory and properties of the underlying eigenvalue problem. Solutions to response problems will be cast in terms of eigenfunction expansions. Time-permitting, we shall also explore other special topics.		
2. 教学目标/Course Objective			
Through this course, the students are expected to understand the fundamental theories and concepts of mechanical vibrations, as well as their applications in robotic engineering. Based on the learnt mechanics principles and mathematical tools, the students are also expected to abstract the mechanical vibration problems of robotic engineering into dynamic models and the equations of motions. The students should be able to analyze the transient dynamics and steady-state dynamics of SDOF systems, MDOF systems, and continuous systems under external excitations. This course will lay a solid foundation for future work or research in the fields of vibration analysis, robot structure design, and robot dynamics.			
3. 教学内容及进度安排/Course Content & Schedule			

课次/模块	教学周	教学内容及预期效果	作业/练习		
1	1	INTRODUCTION			
2	2	REVIEW OF SINGLE DEGREE OF FREEDOM	1		
3	3	REVIEW OF ANALYTICAL DYNAMICS	2		
4	4	MULTI-DEGREE OF FREEDOM SYSTEMS	3		
5	5	CONTINUOUS SYSTEMS	2		
4. 课程考核及成绩评定/Course Assessment & Grading					
考核形式 Assessment Criteria	权重 Percentage	评定标准 Assessment Standard			
出勤/Attendance	8	缺勤1次扣2分，缺勤4次及以上扣完			
课堂表现/Participation					
作业/实验/实践/ Assignment(s)	32	每次作业4分，总共8次作业			
课程论文/Course Paper					
开卷考试/Open-book exam					
闭卷考试/Close-book exam	40	卷面分100分，按40%折算计入总成绩			
其他/Other(s)	20	期中考试卷面分100分，按20%折算计入总成绩			
5. 教材/Textbook(s)					
序号 No.	名称 Title	编著者 Author(s)	标准书号 ISBN	出版机构 Publisher	出版年月 Publication Date
1	讲义	/	/	/	/
6. 教学参考资料/Reading Materials and References					
1振动力学倪振华西安交通大学出版社1988 2Fundamentals of VibrationsLeonard MeirovitchMcGraw-Hill2001					
7. 任课教师简介/Profile of Instructor(s)					
方虹斌，复旦大学智能机器人研究院，青年研究员、博士生导师，国家海外高层次引进人才，国家重点研发计划项目首席科学家，上海市“科技创新行动计划”启明星。现任美国机械工程师协会（ASME）振动与噪声技术委员会（TCVS）委员，中国机械工程学会机器人分会委员，中国复合材料学会智能复合材料专业委员会委员，上海市力学学会动力学与控制专委会副主任；担任《Theoretical and Applied Mechanics Letters》和《动力学与控制学报》编委，《力学学报》和《固体力学学报》特邀青年编委。 主要从事仿生移动机器人、折展编织机器人、折纸力学超材料、机械智能、非线性多体系统动力学与控制等方面的研究，在本领域权威学术期刊和会议发表论文80余篇，作为负责人主持国家重点研发计划、国家自然科学基金项目、军委科技委项目等多项。曾获SPIE仿生学最佳论文一等奖，上海市振动工程学会英才奖等。					
办公地址 Office Add	新金博大厦603室			办公时间 Office Hour	待定
联系邮箱 Email Add	fanghongbin@fudan.edu.cn			联系电话 Contact phone	