ME助教分享会

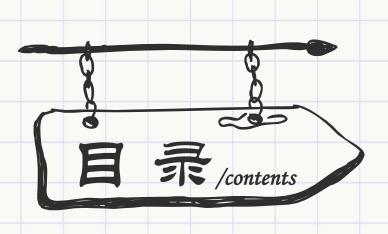


May 16th, 2019

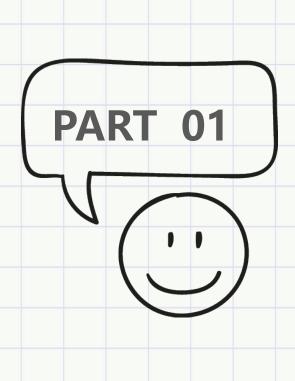
VV214

TA: 李煜舟









课程简介

Olga Danilkina

Office: 437B@JI building

Email: olga.danilkina@sjtu.edu.cn

OH: TBA

TA: 李煜舟 Li Yuzhou

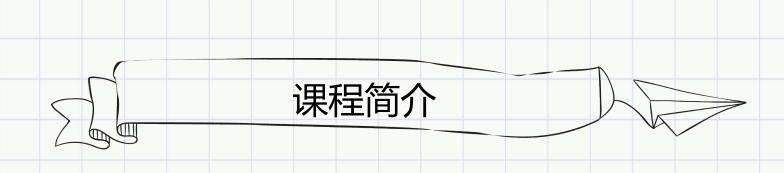
Wechat: liyuzhou956495625

Email: <u>lyz0123@sjtu.edu.cn</u>

OH: TBA

RC: TBA





Course Description

The course gives a detailed introduction to linear algebra and its applications in various areas.

In the first part of the course, we shall consider problems related to solutions of systems of linear equations, linear transformations, general linear spaces and inner product spaces, and applications of linear algebra in geometry and statistics.

In the second part of the course, we shall focus on linear dynamical systems including such questions as determinants, eigenvalues and eigenvectors, spectral theorem for symmetric matrices and its applications to quadratic forms.



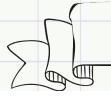
课程简介

Teaching Schedule

Date	Topic	References
26/02	Introduction to systems of linear equations. Matrices, vectors, Gauss-Jordan elimination.	§1.1-1.2
28/02	Reduced row-echelon form. Matrix Algebra. Rank of a matrix.	§1.3
01/03	\mathbb{R}^n as a linear space	§4.1
05/03	Linear transformations.	§2.1
07/03	Orthogonal projections, reflections, rotations	§2.2
08/03	Matrix products, inverse of a linear transformation.	§2.3-2.4
12/03	Spans, image and kernel of a linear transformation.	§3.1

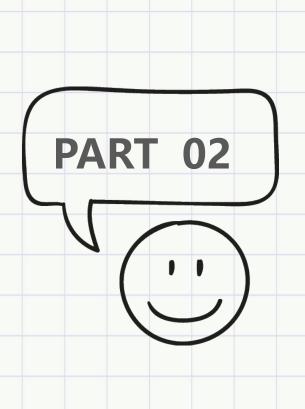
课	程常	箌	1
	•		

14/03	Bases. Linear independence. Dimension.	§3.2-3.3
15/03	Coordinates.	§3.4, 4.3
19/03	Midterm 1	
21/03	Dot products. Orthogonality.	§5.1-5.2
22/03	Gram-Schmidt process and QR factorization.	§5.3
26/03	Least squares approximation.	§5.4
28/03	Determinants and their properties.	§6.1-6.2
29/03	Geometric meaning of a determinant. Cramer's rule.	§6.3
02/04	Linear operators. Isomorphisms.	§4.2
04/04	Inner product spaces and their properties.	§5.5



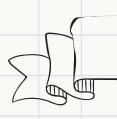
课程简介

09/04	Midterm 2	
11/04	Dynamical systems and eigenvectors.	§7.1
12/04	Eigenvalues of a matrix.	§7.2-7.3
16/04	Diagonalization.	§7.4
18/04	Complex eigenvalues. Stability.	§7.5-7.6
19/04	Diagonalization of a symmetric matrix.	§8.1
23/04	Quadratic forms.	§8.2
25/04	Singular value decomposition.	§8.3
26/04	Continuous dynamical systems.	§9.1-9.2
27/04	Final examination	

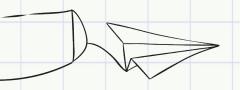


2 评分形式





考试

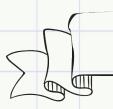


只涉及概念和运算

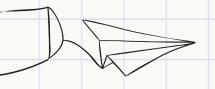


拓展内容也会考

注意考前发的考试范围



Project

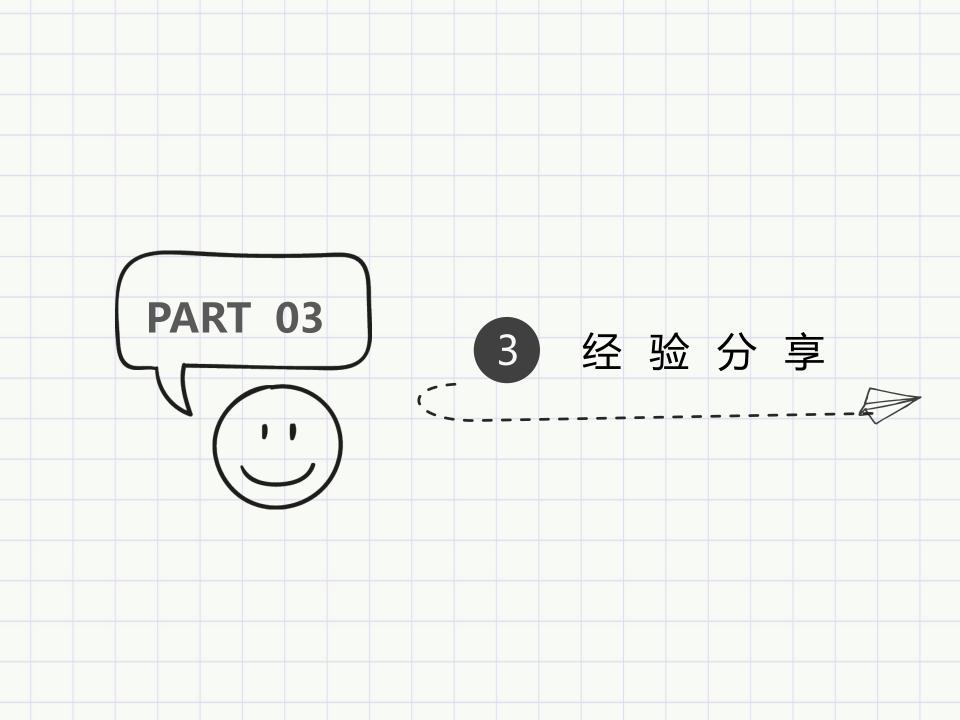


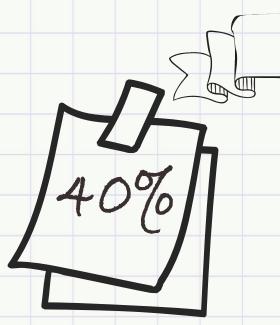


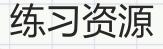
A3纸大小的一张poster

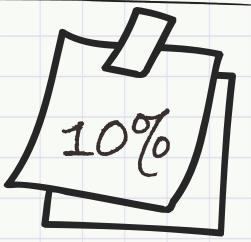
说明其中的数学原理

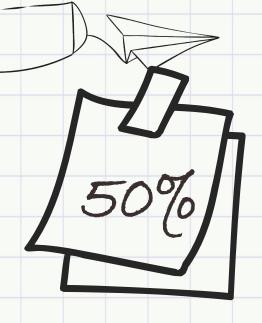
3人一队,自由组队











http://www. math.lsa.umic h.edu/courses /214/exams.h tml?tdsourcet ag=s_pcqq_ai omsg

教材上的例题

作业及课件上的题目



VM235

TA: 龚淳



Content

• Course Introduction

Course Tasks

• Tips

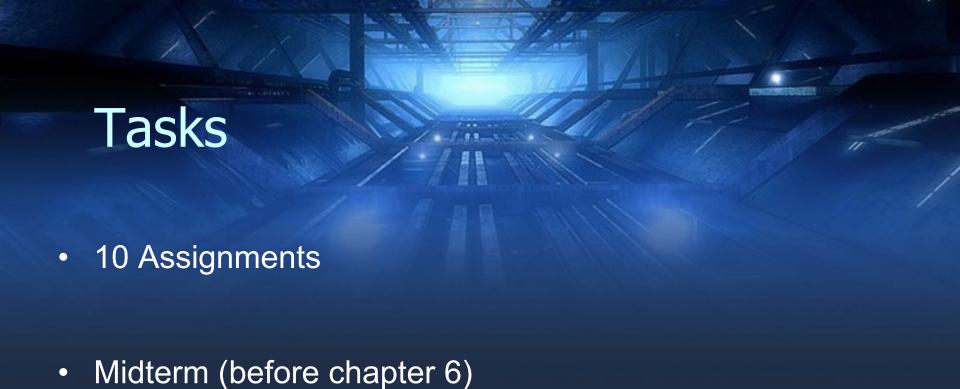
Q&A

Course Introduction

- A basic course of ME
- Prerequiste of VM320; VM395; VM509 this semester
- It has a broad application area ranging from microscopic organisms to common household appliances, transportation vehicles, power generation systems, and even philosophy.

Coverage

- Basic concepts and principles of thermodynamics
- System, state variables, and properties of gases and liquids
- First and second law of thermodynamics and their application
- Work and heat exchange during reversible or irreversible processes
- Analysis of the rated power and performance of gas power and vapor and combined cycles, such as internal combustion engines, gas turbines, power plants and refrigerators



Final (July 29th)



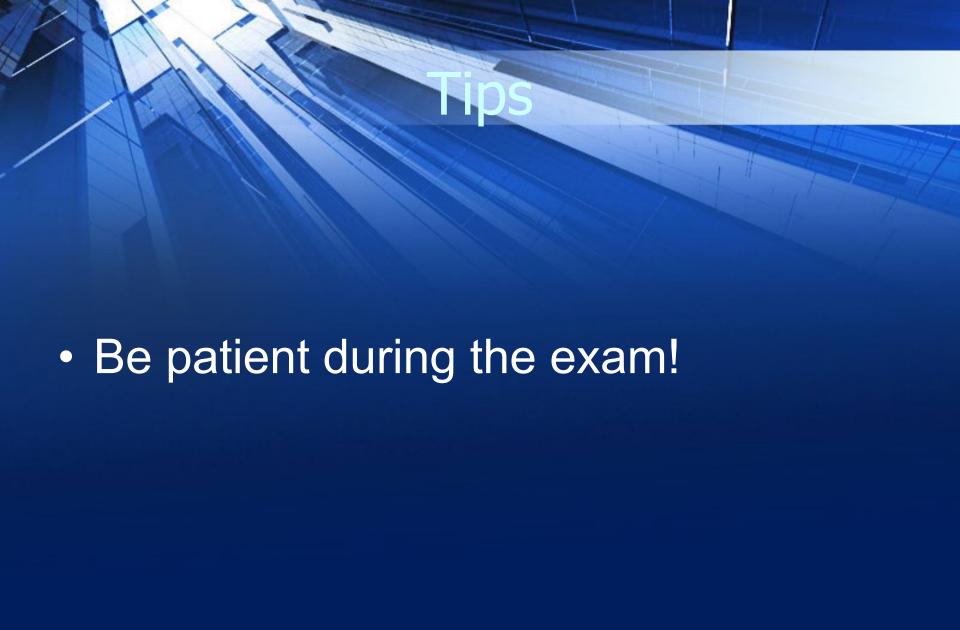


Tips

 Focus on homework but do not waste too much time on a single homework problem! • Do not copy the homework answers from solution manual!

Tips

 Review the basic concepts and get familiar with tables before exam!







VM250

TA: 陈佳茜



Contents

- 课程简介
- 课程准备
- > 经验和教训

课程简介

课程简介:基本信息

- □设计与制造 I (Design and Manufacturing I)
- Program Subject for ME
- □ Course Lecture + Lab + Project

课程简介



Lectures

- Engineering Drawing
 - Orthographic views, Pictorials; Sectional views; Auxiliary views; Dimensioning; Tolerances; etc.
- Engineering Design
 - Conceptual design, QFD; Gantt Charts, Semester project; Mechanism and Statics; Statistics and probability; Materials selection and testing; etc.
- Machine Elements
 - Transmission (Gear, pulleys, belts, chains, etc.); Bearings and wheels; Motor, control and system; Machine elements (Springs, power screws); etc.
- Manufacturing Process
 - Material removal processes; Machining process planning; Polymer shaping processes; Finishing, joining, and assembly; etc.

课程简介



- > Lab
 - > CAD training using Unigraphics NX
 - Week 2-5
 - Time: Friday 4:00 5:40 pm, Monday 6:20 –8:00 pm
 - Catapult Design and Manufacturing
 - ➤ Week 6-12
 - > Time: Monday 6:20 10:00 pm

课程简介



- Project: Automatic Controlled Metal Trebuchet
 - Prototype
 - > Fit 3 types of balls
 - > Throw at fixed points
 - Load balls automatically
 - Remote Control
 - \rightarrow Limited size (35 \times 20 \times 35)
 - Design Review*2
 - > Final Presentation
 - Final Report

课程准备

课程准备

- > VM010/VM020 (金工实习)
 - Basic Manufacturing Skills
- Arduino Programming
 - > 不会在课程中教授, 默认已经会使用

经验与教训

经验和教训

- Safety!!!!!
- Start Early!!!
- Proper Division in the Group!!!
- Communication!!!
- Make Use of Lab Resources!!!
- Simplify the Problem!!
- Assemble and Test Your Prototype before Gameday!!

Q & A

Thank you∼

VM335

TA: 黄程阳

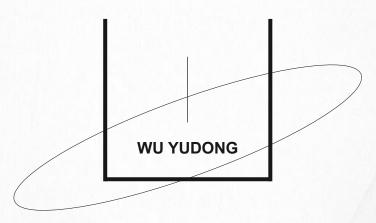
VM360

TA: 吴聿栋



Modeling, Analysis and Control of Dynamic Systems

TA WORKSHOP



CONTENTS 1 Course Introduction



2 Suggestions





Tracks under mechanical engineering:

Design and manufacturing: 250,350

• Material: 382

• Dynamic: 240

• Control: 360

• Solid: 211

• Thermal, fluid, heat: 235,320,335

BIOMECHANICS & BIOSYSTEMS

CONTROL

DESIGN

DYNAMICS & VIBRATION

ENERGY

FLUIDS

MANUFACTURING

MECHANICS & MATERIALS

MECHATRONICS & ROBOTICS

MICRO/NANO ENGINEERING

MOBILITY, AUTOMOTIVE, & TRANSPORTATION

MULTI-SCALE COMPUTATION

THERMAL SCIENCES

After VM360: Introduction to classical control theory

- 450 DESIGN AND MANUFACTURING III
- 455 ANALYTICAL PRODUCT DESIGN
- **461 AUTOMATIC CONTROL**
- 548 APPLIED NONLINEAR DYNAMICS
- **549 STOCHASTIC SYSTEMS**
- 552 MECHATRONIC SYSTEMS DESIGN
- 560 MODELING DYNAMIC SYSTEMS
- 565 BATTERY SYSTEMS AND CONTROL
- 569 CONTROL OF ADVANCED POWERTRAIN SYSTEMS
- 561 DESIGN OF DIGITAL CONTROL SYSTEMS
- 566 MODELING, ANALYSIS, AND CONTROL OF HYBRID ELECTRIC VEHICLES
- 568 VEHICLE CONTROL SYSTEMS
- 569 CONTROL OF ADVANCED POWERTRAIN SYSTEMS
- 584 ADVANCED MECHATRONICS FOR MANUFACTURING
- 662 ADVANCED NONLINEAR CONTROL
- 663 ESTIMATION OF STOCHASTIC SIGNALS AND SYSTEMS

This course includes three major parts:

- 1) Mathematical Modeling,
- 2) Analysis,
- 3) Control.

Students are expected to be able to

- 1) Construct proper models of dynamic systems in graphical and transfer function form,
- 2) Use these models to analyze and simulate the system behaviors including time and frequency response,
- 3) Design/analyze simple linear feedback controllers.

Week	Day	Heading	Lecture Topics	Reading
1	Tuesday	Modeling	Introduction	Chapter 1
	Thursday		Laplace Transforms	2-1 to 2-3
	Friday		Inverse Laplace Transforms	2-4
2	Tuesday	Modeling	Solving ODEs	2-5
	Thursday		Mechanical Systems	3-1 to 3-2
	Tuesday	Modeling	Mechanical Systems	3-3
3	Thursday		Mechanical Systems	3-4
	Friday		Transfer Functions	4-1
4	Tuesday	Modeling	Block Diagrams, Partial-Fraction	4-2 to 4-3
4	Thursday		Transient-Response	4-4
	Tuesday	Modeling	Review I	
5	Thursday		Midterm Exam I	
	Friday		State Space	5-1 to 5-3
6	Tuesday	Modeling	Electrical Systems	6-1 to 6-2
0	Thursday		Electrical Systems	6-3
	Tuesday	Modeling	Electromechanical Systems	6-4
7	Thursday		Electromechanical Systems	6-5
	Friday		Linearization	7-4
8	Tuesday	Analysis	Time-Domain Analysis: 1st order	8-1 to 8-2
8	Thursday		Time-Domain Analysis: 2nd order	8-3
	Tuesday	Analysis	Review II	
9	Thursday		Midterm Exam II	
	Friday		Frequency-Domain Analysis	9-1 to 9-3
10	Tuesday	Control	Control System: Time-Domain	10-1 to 10-2
10	Thursday		Control System: Time-Domain	10-3 to 10-4
	Tuesday	Control	Control System: Time-Domain	10-5
11	Thursday		Control System: Time-Domain	10-6
	Friday		Control System: Frequency-Domain	11-1 to 11-2
12	Tuesday	Control	Control System: Frequency-Domain	11-3
	Thursday	Connor	Review III	
13	Tuesday		Final Exam	

Grading Criteria				
•	Homework	15%		
•	Quiz	10%		
•	Midterm Exam I	20%		
•	Midterm Exam II	20%		
	Final Fyam	35%		



Suggestions

Suggestions

- Generally speaking, this course is not difficult
- For JI ME students, it is the prerequisite for control track
- Not only learn how to calculate with equation -> Understanding is more important!
- For knowledge out of class
- System Dynamics, Ogata, 4th Ed.
- Modeling and Analysis of Dynamic Systems, Close, Frederick, Newell.
- Take advantage of office hour
- Think more about your future career path find your interest.



VM495

TA: 华一赫

VM495 Laboratory II

VM495 Laboratory



AND



Prof. Chen Chienpin Engineering

Prof. Kwee-Yan Teh
Technical Communication



- In VM395, you follow instructions to conduct experiments
- In VM495, you Plan, Design, Build, Run, Analyze, and Document the result of your own experiment



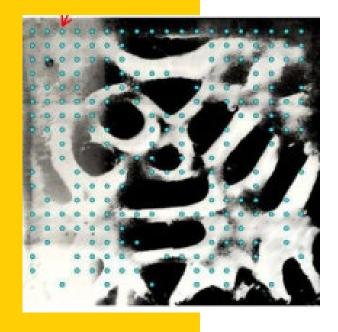
LAB I

Two-Can System Dynamics Modeling

You're asked to building a model to predict no spill condition, AND THEN, THE TA, who is me, will give you an initial volume and you should be able to predict:

- Time to empty first can
- Pressure sensor readings at both initial volume and empty volume
- Time to reach peak volume of second can
- Pressure sensor readings at that peak volume
- Time to empty second can
- Pressure sensor readings at that empty volume

A prediction with accuracy less than 90% will FAIL



LAB II

Self Designed Experiment

- Must be accomplished within time (Week
 13 of semester
- Must involve multiple (>1) measurands
- Must involve computer-based digital data acquisition, including but no limited to DAQ
- Must consider repeatability of measurements, should consider robustness of experimental control



Reliable Teammates

Your hardworking is never comparable to an effective team

Be Critical

Guidance from instructor will be much more limited than VM395, think everything critically

Be Comprehensive

A comprehensive plan of LAB II will save you much time and effort



VM350

TA: 张嘉迪