國立成功大學機械工程系　分析動力學

學分:　3　　教室:　91103　　時間:　週三 2,3, 週五 6

教師:　陳國聲　分機 62192 (kschen@mail.ncku.edu.tw) 機械館 710

助教:　張珈銘, 鄭宥菁 (機械館 A07 室, 62272)

Course Web: http://klab.me.ncku.edu.tw/

Major references:

1. **(DG)** D. T. Greenwood, *Classical Dynamics*, Prentice-Hall, 1977, 北 門
2. **(SC)** S. D. Crandall, *Dynamics of Mechanical and Electromechanical Systems*, Krieger, 1982
3. **(FM)** F. Moon, *Applied Dynamics with Applications to Multibody and Mechatronic Systems*, Wiley, 1998.
4. **(TC)** T. L. Chow, *Classical Mechanics*, Wiley, 1995.
5. **(HB)** H. Baruh, *Analytical Dynamics*, McGraw-Hill, 1999.
6. **(WW)** W. E. Wiesel, *Spaceflight Dynamics*, 2nd Ed., McGraw-Hill, 1997.
7. **(LM)** L. Meirovitch, *Methods of Analytical Dynamics*, McGraw-Hill, 1994.
8. **(AN)** A. H. Nayfeh, *Nonlinear Oscillations*, Wiley, 1979.
9. **(TK)** T. Kane and D. Levinson, Dynamics: *Theory and Applications*, McGraw-Hill, 1985.
10. **(TM)** S. Thornton and J. Marion, *Classical Dynamics of Particles and Systems*, 5th Ed., Thomson, 2004.

課程進度:

因為本學期因國出國多次, 需要密集晚上補課. 目前補課時間以周三晚上 5:10 -7:00 為主, 會事先公告

週數	日期	內容	備註
1	09/11 W	➢ 課程介紹,相關規定 **Lagrange's Mechanics (6 weeks)** ➢ Newtonian mechanics review	赴歐洲公出, 補課時間 0926 Th (7-9 PM)
1	09/13 F	➢ Newtonian vs. Euler Lagrange mechanics ➢ Generalized coordinates, Constraints, Generalized forces	赴歐洲公出, 補課時間 0927 F (6-8 PM)
2	09/18 W	➢ Briefs on Calculus of Variation ➢ Principle of virtual work	赴歐洲公出, 補課時間 1009 W (5-7 PM)
2	09/20 F	➢ Examples ➢ Energy ➢ D'Alembert's principle	赴歐洲公出, 補課時間 1011 F (6-8 PM)
		➢ 第一階段: 缺課 6 hr, 補課: 4hr + 4hr	
3	09/25 W	➢ Hamilton's principle	
3	09/27 F	➢ Lagrange's Equation	

4	10/02 W	➢ Lagrange's Equation examples	赴日本公出，補課時間 1016 W (5-7 PM)
4	10/04 F	➢ Lagrange's equation for nonholonomic constraints	赴日本公出，補課時間 1023 W (5-7 PM)
		➢ 第二階段：缺課 3hr，補課 4 hr	
5	10/09 W	➢ Ignorable coordinate and Routhian function ➢ Examples, Integrals	
5	10/11 F	➢ Linearization ➢ Stability analysis ➢ Vector potential	
6	10/16 W	➢ Non-natural systems ➢ Gyroscopic systems	
6	10/18 F	➢ Small oscillation, modes,	
7	1023 W	➢ modal analysis examples ➢ Lagrange equation for impulsive motion	
7	10/25 F	➢ Hamilton dynamics, ➢ Examples	
8	10/30 W	**Mechatronics (2 Weeks)** ➢ Element laws ➢ Circuit analysis	
8	11/01 F	➢ Mechatronics systems	
9	11/06 W	➢ Mechatronics systems ➢ Piezoelectric systems ➢ **Quiz I-1 In Class**	赴韓國公出，補課時間 1030 W (5-7 PM)
9	11/08 F	**Nonlinear Oscillation (3 week)** ➢ Nonlinear system ➢ Phase diagrams ➢ **Quiz I-2 In class**	赴韓國公出，補課時間 1113 W (5-7 PM)
		第三階段：缺課 3hr，補課 4hr	
10	11/13 W	➢ Elliptical integrals	
10	11/15 F	➢ Simulink examples ➢ Perturbation method	
11	11/20 W	➢ Non-autonomous systems ➢ Parametric excitations	
11	11/22 F	➢ Ritz methods ➢ Chaotic phenomenon ➢ Ecological / social systems	
12	11/27 W	**Continuous Vibration (3 weeks)** ➢ Introduction to continuous vibration ➢ Generalized Hamilton Principle	
12	11/29 F	➢ String vibration: variation approach	
13	12/04 W	➢ Bar Vibration and natural modes ➢ **Quiz II-1 In class**	赴歐洲公出，補課時間 1120 W (5-7 PM)
13	12/06 F	➢ Beam vibration: variation approach ➢ Timoshenko beams ➢ **Quiz II-2 In class**	赴歐洲公出，補課時間 1127 W (5-7 PM)
		第四階段：缺課 3hr，補課 4hr	
14	12/11 W	➢ Orthogonality and self adjoint	
14	12/13 F	➢ Forced vibrations solving schemes ➢ More on continuous structures	
15	12/18 W	**Rigid body in space (3 weeks)** ➢ Kinematics ➢ Euler angles, energies	
15	12/20 F	➢ Euler angles, energies ➢ Lagrange's approach for 3D rigid body dynamics	

16	12/25 W	➢ Lagrange's approach for 3D rigid body dynamics	
16	12/27 F	➢ Examples	
17	01/01 W	➢ Examples ➢ Stability analysis	元旦放假
17	01/03 F	➢ Rolling cone example ➢ Space dynamics, Gyroscopic effect	
17*		➢ Fundamental equation, Kane's dynamics. G-A equation	
18	01/08 W	➢ **Final Quiz-1 In class**	
18	01/10 F	➢ **Final Quiz-2 In class**	

總計: 預估缺課 12 hr, 補課 20+ hr, in class quiz I & II 6 hr. Total addition course hours ~ 13-15 小時的裕度, 以應付突發狀況 (包括國定假日放假)

基本上應該不會有欠課的狀態發生

成績計算: 作業 (約 8 次): 25% Quiz (3 次): 75%

(由於 Conference 的關係, 或許我們會將考試的實施細則做更細膩的安排)

Quiz I: 11 月 06, 08, cover 範圍: Lagrange's Mechanics

Quiz II: 12 月 04, 06, cover 範圍: Hamilton's equation, Nonlinear dynamics

Quiz III: 期末考周, cover 範圍: Continuous vibration, Rigid body dynamics