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<thead>
<tr>
<th>開課系所</th>
<th>機械系 碩博、碩</th>
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<tr>
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<tr>
<td>課程名稱（中文）</td>
<td>機器人系統設計</td>
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<td>課程名稱（英文）</td>
<td>Mechanical Design of Robotic System</td>
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<tr>
<td>課程碼</td>
<td>N155400</td>
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<tr>
<td>分班碼</td>
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<tr>
<td>先修科目或先備能力</td>
<td>Basic concept of mechanical design</td>
</tr>
<tr>
<td>學分數</td>
<td>3</td>
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<tr>
<td>開課教師</td>
<td>蔡明俊</td>
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<tr>
<td>Office Hours</td>
<td>By appointment</td>
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**課程概述**
This course teaches about the mechanical design aspect of a robotic system. The topics include: robotics history, geometrical design, structural design, power, transmission, actuation, and instrumentation, forward and inverse position analysis, velocity and kinetostatic analysis, dynamic analysis, and finally the task and motion planning.

**教學目標**
Enable students to design a robotic system

<table>
<thead>
<tr>
<th>授課課程大綱明細</th>
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| 1. Introduction  
-Introduction to Robotic System |
| 2. Geometry Design and Optimal Working Space  
(a). Regional Structure  
(b). Orientation structure  
(c). Normalized Volume Index. |
| 3. Structural Design of Manipulators  
(a). Structural Compliance, Actuator Compliance  
(b). Static Deflection  
(c). Dynamic Compliance and Natural Frequencies. |
| 4. Power Actuation, Transmission, and Instrumentation  
(a). Power actuation,  
(b). Transmission |
5. Robotic Forward Position Analysis
   (a) forward problem
   (b) Homogeneous Coordinates
   (c) Homogeneous Transformation
   (d) Rotation Matrix and Representations

6. Robotic Inverse Position Analysis
   (a) inverse problem
   (b) Straight line motion algorithm using inverse kinematic

7. Robotic Velocity Analysis
   (a) forward Jacobian formulation.
   (b) inverse Jacobian problem
   (c) Duality between static & instantaneous kinematics

8. Robotic Dynamics Analysis
   (a) Lagrange Method
   (b) Newton Euler Method

9. Programming and Trajectory Planning
   (a) Programming method
   (b) Cubic spline trajectory
   (c) 1-4-1 spline trajectory
   (d) Other blended and mixed trajectories

10. Design/Research and System Integration Project

參考書目
Ming J. Tsai, “Mechanical Design of Robotics System”, Class Note.

課程要求
Write a C++ computer program to execute robotic motion

評量方式
3-4 home works, @10-15%
1 midterm exam, 20%
1 final project (include a proposal and a final presentation) 20-25%

課程網址
助教資訊
備註