

# 課 綱 Course Outline

理工學院學士班

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| 中文課程名稱<br>Course Name in Chinese                                                                                                                                                                                                                                                                                                                                                                                           | 機器導航與探索                            |                  |                 |                |     |
| 英文課程名稱<br>Course Name in English                                                                                                                                                                                                                                                                                                                                                                                           | Robotic Navigation and Exploration |                  |                 |                |     |
| 科目代碼<br>Course Code                                                                                                                                                                                                                                                                                                                                                                                                        | TCAI50030                          | 班 別<br>Degree    | 碩士班<br>Master's |                |     |
| 修別<br>Type                                                                                                                                                                                                                                                                                                                                                                                                                 |                                    | 學分數<br>Credit(s) | 3.0             | 時 數<br>Hour(s) | 3.0 |
| 先修課程<br>Prerequisite                                                                                                                                                                                                                                                                                                                                                                                                       |                                    |                  |                 |                |     |
| 課程目標<br>Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                  |                                    |                  |                 |                |     |
| 本課程模組分為三個主要的部分，分別為即時追蹤與地圖建置(SLAM)、基於機器學習之場景理解(Scene Understanding)與探索導航的動作控制(Action Control)。即時追蹤與地圖建置部分包含機率模型與相機模型等理論基礎，也包含基於深度學習之 RGB-based 的 3DSLAM 方法。場景理解的部分包含機器學習的基本概念，再帶到深度學習的技術與目前的物件偵測與語意切割技術。動作控制的部分則包含路徑規劃與導航演算法，並帶入強化學習的概念來引導行進的路徑。                                                                                                                                                                            |                                    |                  |                 |                |     |
| 課程大綱<br>Course Outline                                                                                                                                                                                                                                                                                                                                                                                                     |                                    |                  |                 |                |     |
| 1.Introduction to Robotic Navigation and Exploration<br>2.Kinematic Model and Path Tracking Control<br>3.Motion Planning<br>4.Reinforcement Learning (I)<br>5.Reinforcement Learning (II)<br>6.Project Environment Building (I)<br>7.Project Environment Building (I)<br>8.Project Environment Building (III)<br>9.SLAM Back-end (I)<br>10.SLAM Back-end (II)<br>11.3D SLAM (I)<br>12.3D SLAM (II)<br>13.3D Embodied Agent |                                    |                  |                 |                |     |
| 資源需求評估(師資專長之聘任、儀器設備的配合．．．等)<br>Resources Required(e.g. qualifications and expertise, instrument and equipment,etc.)                                                                                                                                                                                                                                                                                                        |                                    |                  |                 |                |     |

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| <p><b>課程要求和教學方式之建議</b></p> <p><b>Course Requirements and Suggested Teaching Methods</b></p>                                                                 |
| <p>課程要求建議學生需已修過 Python 程式設計、影像處理、深度學習。<br/>學生須自備具 GPU 顯卡之電腦。</p> <p>成績評量方式<br/>作業：60% (15% for each HW)<br/>論文閱讀報告(10%)<br/>自走車期末專題(含實作、書面報告、口頭報告): 30%</p> |
| <p><b>其他</b></p> <p><b>Miscellaneous</b></p>                                                                                                                |
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