109學年度 第2學期 先進化合物半導體及其應用 Advanced Compound Semiconductors and Their Applications 課程綱要

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| 課程名稱：（中文）先進化合物半導體及其應用（英文）Advanced Compound Semiconductors and Their Applications | 開課單位： | 半導體碩  |
| 永久課號： | CST5056 |
| 授課教師：潘康瑞Krishna Pande |
| 學分數： | 3.00 | 必／選修： | 選修 | 開課年級： | \* |
| 先修科目或先備能力：Course will discuss current state of the art of HEMT technology, InP HBT, GaN power HEMT, FinFET , high frequency GaN CMOS, 2D material and devices, THz technology, quantum structures, spintronics, hetero epitaxy and device processing & characterization . Various commercial applications of such technology to be covered. Note: Course will be taught by professor Krishna Pande (Fellow of IEEE and pioneer of InP technology) both online and in class room.  |
| 課程概述與目標：This graduate level course will cover: Physics, modeling, properties, bandgap engineering, device fabrication, design and application of compound semiconductor devices. Emphasis will be placed on high frequency HEMT, HBT, 2-D material based devices and Tera hertz technology. Focus will be on GaN hetero structure based devices, hetero epitaxy, fabrication and applications. On hand training using S-parameter, smith chart concerning the application of devices will be provided. Discussion on hetero epitaxial devices will consist of on chip fabrication of microwave, photonic and digital devices. Packaging, combining and integration of chips will be discussed. Discussion will be on chip receiver including components like LNA, antenna.  |
| 教科書（請註明書名、作者、出版社、出版年等資訊）： | No good text book (under evaluation) is available currently. Hence instructor notes will be used for teaching. However, following books will be consulted (all of these books are available in NCTU library):1) Compound semiconductor materials and devices Morgan ＆amp; Claypool Publishers, 2016.2) Compound semiconductor technology, Colliver, David J. Dedham, Mass: Artech House c1976.3) Compound semiconductor device modelling, London : Springer-Verlag c1993. |

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| 課程大網 | 分配時數 | 備註 |
| 單元主題 | 內容綱要 | 講授 | 示範 | 習作 | 其他 |

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| 教學要點概述： |
| 1.學期作業、考試、評量1) Midterm Exam: 30%2) Final exam- 30%3) Final Presentation-40%2.教學方法及教學相關配合事項（如助教、網站或圖書及資料庫等）Lecture notes will be provided by TA's. |
| 師生晤談 | 排定時間 | 地點 | 聯絡方式 |
| By Appointment | By Appointment | kppande@nctu.edu.tw |

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| 每週進度表 |
| 週次 | 上課日期 | 課程進度、內容、主題 |
| 1 | 2/26 | Introduction to current state of the art and future technology.  |
| 2 | 3/5 | Physics, modeling, bandgap engineering of GaN HEMT and InP HBT. |
| 3 | 3/12 | Growth and fabrication of next gen compound semiconductor devices with commercial applications (for example high frequency HEMT and HBT).  |
| 4 | 3/19 | Growth and fabrication of next gen compound semiconductor devices with commercial applications (for example high frequency HEMT and HBT).  |
| 4 | 3/26 | Device packaging and testing.  |
| 6 | 4/2 | Holiday adjustment  |
| 7 | 4/9 | Hetero epitaxy and stacking of microwave, photonics and digital devices on a chip. |
| 8 | 8 4/16 | Midterm Exam |
| 9 | 4/23 | 2-D materials and devices,.  |
| 10 | 4/30 | Spintronics and quantum structures.  |
| 11 | 5/7 | Tera hertz devices |
| 12 | 5/14 | Device characterization using S-parameters |
| 13 | 5/21 | Device impedance evaluation using smith chart.  |
| 14 | 5/28 | Introduction to design software ADS and HFSS for on hand training.  |
| 15 | 6/4 | Design and fabrication of receiver components, an example of device applications.  |
| 16 | 6/11 | Presentation |
| 17 | 6/18 | Final exam |
| 18 | 6/25 | On chip receiver, fabrication and testing.  |

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| 備註： |
| 1.請遵守智慧財產權觀念及勿使用不法影印教科書。 |
| 2.其他欄包含參訪、專題演講等活動。 |
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