



澳門機電工程師學會

The Macao Institution of Electrical and Mechanical Engineers

持續進修發展計劃

Program of Development and continuous study

太陽能光伏發電系統設計基礎課程

Solar photovoltaic generation system design Fundamental Course

講者:楊洪興博士

Lecturer:Dr.Yang HongXing

學時:12小時

Class Hour:12 Hours

日期:2011年8月27日和9月3日(星期六)

Date: 27 August 2011&3 September 2011(Saturday)

上課時間: 10:00-13:00,14:30-17:30

Time: 10:00-13:00,14:30-17:30

地點(Venue): 澳門羅理基博士大馬路600號E,第一國際商業中心,1505室



人數:20 名額有限,報名從速!

Class :20 students Quota is limited, Please be quick!

參加者於完成活動後將獲本會頒發持續專業進修(CPD)系統認可的證書一張

Certificates of Attendance will be given to Participations(CPD)

澳門特區政府《持續進修發展計劃》課程資助編號:1107250675

課程簡介: 太陽能光伏發電課程 (共四節, 每節三個小時)

本課程的教學目的是, 通過學習, 使學員掌握太陽能光伏發電系統的基本概念、設計方法和應用例子。本課程的內容大體上可分為四部分:

- 第一部分是介紹太陽能光伏板的基礎知識, 包括光伏板的基本參數、基本計算及其發電原理等;
- 第二部分是介紹太陽能光伏系統規劃與設計, 主要內容包括光伏發電工程的可行性研究, 初步設計和系統詳細設計等;
- 第三部分是太陽能光伏系統發電量類比計算, 此部分將講述太陽能光伏系統的設計是基於哪些特定氣象條件下進行的以及如何分析全年運行狀況等;
- 第四部分是太陽能光伏系統能工程實例, 本節課程首先介紹各種典型光伏發電系統的詳細設計和運行情況, 然後前往澳門最早的一個聯網光伏發電工程進行實地考察, 通過理論與實際結合讓學員體會太陽能光伏發電的設計優越性及運行詳情, 並且完整地瞭解系統中各部件的特性。

適合參加的人士

此培訓課程適合那些對太陽能光伏發電系統設計有興趣之技術人員、工程師及有意從事該行業的工程系學生。

講者簡介



本會今次非常榮幸邀請到“香港理工大學屋宇設備工程學系”教授 – 楊洪興博士為我們主講今次的課程。楊洪興博士 1982 年畢業于天津大學暖通空調專業, 1985 年在本校獲得碩士學位, 1989 年去英國威爾士大學卡迪夫學院學習, 於 1993 年獲得博士學位, 並留校做了兩年的博士後研究。從 1995 年開始, 他受聘於香港理工大學屋宇設備工程學系進行教學與科研工作, 主要領域包括建築節能和可再生能源利用的研究。他已發表 150 多篇各種雜誌和會議論文, 在建築節能和太陽能 - 風能利用方面具有豐富的經驗和建樹。有關楊教授的詳細履歷, 曾參與的研究項目和發表過的主要學術文章, 請參閱 附件 2。

報名方式

請填妥報名表格通過傳真(+853-2883-7701)或電郵(info@aeemm.org.mo)發給本會, 讓我們為您預留位置。表格詳見附件 1。

繳費方式

學費: 840 MOP 課程雜費: 100

1. 獲《持續進修發展計劃》澳門幣 5000 元資助的報名學員, 可攜帶居民身份證到本會會址進行繳費, 課程費用及保證金將於資助戶口中扣除, 若餘額不足, 則要自行補上未繳交費用。教青局收到學員完成項目的資料後, 會將保證金退回其進修帳戶; 倘因患病或不可抗力而未能完成項目者, 在提交證明並獲教青局批准後可退回保證金。(如報名的未滿 18 歲, 應填寫專用的報名表格 (<http://www.dsej.gov.mo/pdac/form.html>), 其中應具該居民父母或監護人為同意有關報名而作出的簽署。)倘未能親身報名, 代辦人須出示其澳門居民身份證、報名者的

澳門居民身份證副本及由其簽署的委託文件 (<http://www.dsej.gov.mo/pdac/form.html>),方可辦理報名手續。

詳情可瀏覽 <http://www.dsej.gov.mo/pdac/citizen.html> 及 <http://www.dsej.gov.mo/pdac/subsidy.html>

2. 其他學員或公司學員，則請將報名費用（不用繳納保證金）存入本會大西洋銀行戶口(號碼：9008987130)，並將填妥的報名表及存款證明傳真至本會 Fax：+853-2883-7701 或電郵 info@aeemm.org.mo.本會將有專人回覆確認收妥。

3. 若在課程舉行前 5 天獲本會的同意，有關款項將退回個人進修帳戶。

4. 如申請人不能完成所報讀的本地課程，所繳付的保證金將不獲退回。

5. 中途放棄修讀，其已繳交之學費，將會不獲退回其個人進修帳戶。

6. 出席率達 80%的學員才能視為完成課程



附件1

報名表 Enrolment Form

澳門機電工程師學會
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姓名	報讀課程	性別	身份證號碼	聯絡電話	聯絡電郵	出生日期	職業

填妥表格後請傳真至(853)2883-7701或電郵至info@aeemm.org.mo,若有疑問可致電(853)-28838511 傅小姐

附件2

楊教授的詳細履歷，曾參與的研究項目和發表過的主要學術文章

履歷:

- 1985-1987 任職天津大學土木系暖通教研室講師
- 1987-1989 任職天津大學天津地熱研究中心暖通工程師
- 1993-1995 在英國卡迪夫威爾士大學機械工程系做博士後研究
- 1995-2003 任職香港理工大學屋宇設備工程學系助理教授
- 2003-2008 任職香港理工大學屋宇設備工程學系副教授，博士生導師
- 2008 至今 任職香港理工大學屋宇設備工程學系教授，博士生導師

參與研究的項目（最近三年）：

1. 2006-2008: Development of the Ground-Coupled Heat Pump Technology for Air-conditioning and Hot Water Supply in Hong Kong, Hong Kong Research Grant Council.
2. 2006-2010: Development of Advanced Renewable Energy Technologies, Hong Kong Sun Hung Kai Property Group.
3. 2007-2010: Investigation on Hybrid Ground-Coupled Heat Pump Applications for Air-Conditioning in Hot-Weather Areas, Hong Kong Research Grant Council.
4. 2009-2011: Environmental payback time analysis of building-integrated photovoltaic (BIPV) applications in Hong Kong, Environmental Conservation Fund.
5. 2009-2011: Investigation and development of large-scale (MW) grid-connected thin film photovoltaic power stations integrated with buildings, Hong Kong Innovative Technology Fund.

發表的主要學術期刊文章（最近五年）：

1. Han, J, L Lu and H Yang, Thermal behavior of a novel type see-through glazing system with integrated PV cells, *Building and Environment*, Vol.44, No.10, pp.2129-2136, Oct 2009.
2. Cui, P, H Yang and Z Fang, Energy and exergy analysis of hybrid ground coupled heat pumps with hot water supply, accepted by *International Journal of Exergy*, Vol.6, No.3, pp.388-404, 2009.
3. Han, J, H Yang and L Lu, Investigation on the thermal performance of different lightweight aluminum standing-seam roofing structure, *Applied Thermal Energy*, Vol.29, pp.2491-2499, 2009.
4. Yang, H, T Chen and Z Zhu, Numerical study of forced turbulent heat convection in a straight square duct, *International Journal of Heat and Mass Transfer*, Vol.52, pp.3128-3136, 2009.
5. Wang, H, Y Liu, H Xu, X Dong, H Shen, Y Wang and H Yang, An investigation on the novel structure of dye-sensitized solar cell with integrated photoanode, Vol.34, No.6, pp.1635-1638, *Renewable Energy*, 2009.
6. Cui, Ping, Yang H and Fang Z, Simulation of hybrid ground-coupled heat pump with domestic hot water heating systems using HVACSIM+, *Energy and Buildings*, Vol.40, No.9, pp.1731-1736, June, 2008.
7. Li, Y and Yang H, Investigation on solar desiccant dehumidification process for energy conservation of central air-conditioning systems, *Applied Thermal Engineering*, Vol.28, No.10, pp.1118-1126, July 2008.
8. Yang H and Zhu Z, Numerical study of three dimensional turbulent natural convection in a differentially heated air-filled tall cavity, *International Communications in Heat and Mass Transfer*, Vol.35, No.5, pp.606-612, 2008.
9. Yang H and Zhu Z, Numerical study of three dimensional turbulent natural convection in a differentially heated air-filled tall cavity, *International Communications in Heat and Mass Transfer*, Vol.35, No.5, pp.606-612, 2008.
10. Yang, H, Zhou W and Fang Z, Optimal sizing method for stand-alone hybrid solar-wind system with LPSP technology by using genetic algorithm, *Solar Energy*, Vol.82, No.4, pp.354-367, April 2008.
11. Yang, H, Lu L and Zhou W, A novel optimization sizing model for hybrid solar-wind power generation system, *Solar Energy*, Vol.81, No.1, pp.76-84, January 2007.
12. Yang, H. and Lu L, The optimum tilt angles and orientations of PV claddings for building integrated photovoltaic (BIPV) applications, *ASME Journal of Solar Energy Engineering*, Vol.129, No.2, pp.253-255, 2007.
13. Yang H, Zhou W, Lu Lin and Fang Zhaohong, Battery behavior prediction and battery working states analysis of a hybrid solar-wind power generation system, *Renewable Energy*, Vol.33, pp.1413-1423, 2008.
14. Cui, P, Yang H and Fang Z, The simulation model and design optimisation of ground source heat pump systems, *HKIE Transactions*, Vol.14, No.1, March 2007.
15. Zhou, W, Yang H and Fang Z, A novel model for PV array energy performance prediction, *Applied Energy*, Vol. 84, No.12, pp.1187-1198, 2007.
16. Zhou, W, Yang Hongxing, Lu Lin and Fang Zhaohong, Optimum design of hybrid solar-wind-diesel power generation system using genetic algorithm, *HKIE Transactions*, Vol.14, No.4, Dec 2007.
17. Cui, P, Yang H and Fang Z, Numerical analysis and experimental validation of heat transfer in ground heat exchangers in alternative operation modes, *Energy and Buildings*, Vol.40, No.6, pp.1060-1066, 2008.
18. Fung, Y and Yang H, Study on thermal performance of semi-transparent BIPV glazing, *Energy and Buildings*, Vol.40, No.3, pp.341-350, 2008.

19. Yang, H and Li Y, Potential of building-integrated photovoltaic applications, *Low Carbon Technologies*, Vol.2, No.3, pp.250-261, July 2007.
20. Ren, C and Yang H, An analytical model for the heat and mass transfer processes in indirect evaporative cooling with parallel/counter flow configurations, *International Journal of Heat and Mass Transfer*, Vol.49, pp.617-627, 2006.
21. Yang, H and Zhu Z, Numerical simulation of turbulent Rayleigh-Benard convection *International Communications in Heat and Mass Transfer*, Vol.33, pp.184-190, 2006.
22. An, D, Wang Z, Zhang S and H. Yang, Low-temperature pyrolysis of municipal solid waste: influence of final pyrolysis temperature on the characteristic of solid fuel, *International Journal of Energy Research*, No.5, Vol.30, pp.273-364, 2006.
23. Cui, P, Yang H and Fang Z, Heat transfer analysis of ground heat exchangers with inclined boreholes, *Applied Thermal Engineering*, Vol.26, No.11-12, pp.1169-1175, 2006.
24. Zhou, W, Yang H and Fang Z, Wind power potential and characteristic analysis of the Pearl River Deltar region, China, *Renewable Energy*, Vol.31, pp.739-753, 2006.
25. Lou, C, Yang H, Li Y and Zhang Y, Energy audit of buildings: a case study on a commercial building in Causewaybay of Hong Kong, *HV&AC*, No.5, Vol.36, pp44, 2006.
26. Yang, H, Ren C and Cui P, Study on performance correlations of an indirect evaporative cooler with condensation from primary airflow, *ASHRAE HVAC&R Research*, Vo.12, No.3, pp.519-532, July 2006.
27. Zhang, Q, Lou C and Yang H, Trends of Climate Change and air-conditioning Load of Residential Buildings in China, *Journal of Asian Architecture and Building Engineering*, Vol.5, No.2, pp.435-441, 2006.
28. Yang, H, Lu L, Zhang Q and Lou C, Selections of typical meteorological years and example weather years, and their effect on building energy simulation, *HV&AC*, Vol.35, No.1, pp.130-133, 2005.
29. Fung, Y Y and Yang H, Study on the optimum inclination angle of solar collecting surface in Hong Kong, *HKIE Transactions*, Vol.12, No.1, p44-48, 2005.
30. Yang, H, Lou C and An D, The design and performance monitoring of an eco-building: a case study in Hong Kong, *International Journal of Low Carbon Technologies*, Vol.1, No.1, pp.59-68, January 2005.
31. Yang, H and Zhu Z, Exploring super-critical properties of secondary flows of natural convection in inclined channels, *International Journal of Heat and Mass Transfer*, Vol.47, No.6-7, pp.1217-1226, 2004.
32. Yang, H, Zheng G, An D, Lou C and Burnett J, Grid-connected building-integrated photovoltaics: A Hong Kong case study, *Solar Energy*, Vol.76, No.1-3, pp.55-59, 2004.
33. Tan, L, Yang H and Gu G, Energy efficiency and economics analysis of windows in hot summer and cold winter zone, *HV&AC*, No.8, Vol.34, pp1-6, 2004.
34. Zhu Z, Yang H, Jiang R and Wu Q, Investigation of conjugate heat transfer in a photovoltaic wall, *Heat Transfer-Asian Research*, Vol.33, No.2, 2004.
35. Chan, K and H Yang, Landfill gas utilization for thermal and electric energy cogeneration, *HKIE Transactions*, Vol.11, No.1, pp.1-6, 2004.
36. Lu, L and Yang H, A study on simulation of power output and practical models for building-integrated photovoltaic systems, *ASME Journal of Solar Energy Engineering*, Vol.126, pp.1-7, 2004.
37. Yang, H and Lu L, Study on Typical Meteorological Years and their effect on building energy and renewable energy simulations, *ASHRAE Transactions*, Vol.110, Part 2, pp.424-431, 2004.