應用力學研究所 電腦在工程數學上之應用

課程資訊

- 課程名稱：電腦在工程數學上之應用(Symbolic Computation in Engineering Mathematics)
- 開課學期：97-1
- 開課系所：應用力學研究所
- 授課教師：李世光、陳俊杉、林致廷、張培仁、吳文中、楊燿州、施文彬
- 課程編號：
- 班次：
- 學分：3
- 全/半年：半年
- 必/選修：選修，限制 60 人。
- 上課時間：9/23 起，每週二 18:00~21:00
- 上課地點：工學院電腦教室
- 備註：計入本系課程。
- 課程網址：
- 課程概述：

This one-semester course is designed for students who have taken basic Engineering Mathematics but are uncertain about how to deal with the apparently tedious mathematical calculations steps often needed to handle true engineering problems using pencil and paper without making mistakes. To fully utilize the computation power available on one’ s personal computer nowadays, **Computer Algebra System** (CAS) also known as **Symbolic Computation** will be introduced in this course to help the students see first hand on the interactions which exists in mathematics, physics, engineering, etc. In addition, the advanced portion of each section extends Engineering Mathematics to mathematics of a graduate level. Undergraduate students who are interested in getting a glimpse of how to handle more advanced mathematical calculations are strongly encouraged to explore that part of the lecture notes.

The CAS program utilized in this course is a freeware called Maxima. This program is a free computer algebra system based on a 1982 version of MACSYMA, which was developed by MIT Lincoln lab for a long period time. This program is compatible with many operating system that include Windows, Linux, and MacOS. Students who are to take this course can download this program from: http://sourceforge.net/project/showfiles.php?group_id=4933 in order to practice the operation and to do the homework.

It should be noted that this course is not a computer language course. It is really a revisit of the Engineering Mathematics by using the Computer Algebra System to facilitate the students gain more insights in Engineering Mathematics/Applied Mathematics. Since there is no standard text book available with the course goal mentioned above, the lecturers and teaching assistants have put their efforts together to write a full lecture notes for this course.

- 課程目標：

  To expose the students to state-of-the-art Computer Algebra System and to make sure the students know how to use this type of calculation platform for advanced mathematical derivations, interactions of mathematical modeling and engineering/physical systems. The students are expected to become efficient in handling tedious mathematical calculations by using CAS.

- 課程要求：

  As this course will not re-teach all basics of Engineering Mathematics, students who are to take this course are assumed to have learned the contents of Engineering Mathematics listed in Course Outline below.

- Office Hours：
- 參考書目：
  - 所有教師與助教共同編撰的講義（將以 pdf 檔方式提供）
  - “Proceedings of the Second Symposium on Symbolic and Algebraic Manipulation (SYMSAM ‘71),” Los Angeles, ed. By S. R. Petrick, ACM Press, New York (1971).
  - “Proceedings of the 1968 Summer Institute on Symbolic Mathematical Computation (ed. By R. G. Tobey),” IBM Programming Lab. Rep. FSC69-0312(1969).
  - K. O. Geddes, S.R. Czapor, and G. Labahn, “Algorithms for Computer Algebra,” Kluwer Academic Publishers, London (1992).
  - http://en.wikipedia.org/wiki/Computer_algebra_system
  - http://en.wikipedia.org/wiki/Maxima_(software)
  - http://maxima.sourceforge.net/documentation.html
- 評量方式：
  - 作業 40%
  - 一次期中考 30%
  - 期末考 30%

助教資訊

- 助教：鄭琮達、張晉愷、陳德薰、郭蘋漢、王筑顗……等。
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課程進度

1.	Introduction	(1 week)	李世光	9/23
2.	Matrices	(1 week)	李世光	9/30
3.	Vector/Tensor Analysis	(2 weeks)	陳俊杉	10/7, 10/14
4.	ODE	(2 weeks)	林致廷	10/21, 10/28
5.	期中考			11/4
6.	Laplace & Fourier Transform	(2 weeks)	張培仁	11/11, 11/18
7.	Power Series and Series Solution	(2 weeks)	吳文中	11/25, 12/2
8.	Complex analysis	(2 weeks)	楊燿州	12/9, 12/16
9.	PDE	(2 weeks)	施文彬	12/23, 12/30
10.	Recitation		助教	
11.	期末考			

3 units (3 hours lecture with some lecture in computer lab)