UNIVERSITY OF CALGARY
DEPARTMENT OF PHYSICS and ASTRONOMY
COURSE OUTLINE

1. **Physics 481, Computational Physics II**

   Lecture Sections:

   L01: TuTh, 17:00-18:15, ST 059
   M01: TuTh, 16:15-19:30, ST 026
   Instructor, D. Hobill   Office SB 539
                                        Tel. No., 403-220-6965
                                        e-mail address, hobill@phas.ucalgary.ca
                                        Office Hours: MW 13:30-15:30

                                        Main PHAS Office SB605, telephone no., 403-220-5385

2. **PREREQUISITES:** Physics 381, 455
   CO-REQUISITES: Physics 443 or Chemistry 373

3. **GRADING:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Assignments	40%	
Term Project	10%	
Midterm test	15%	(Late Oct- Early Nov)
Final Examination	35%	(To be scheduled by the Registrar)

   The conversion from final course percentage to final course letter grade will be announced 4 weeks before the date of the final examination

4. **Missed Components of Term Work.** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in section 3.6: **http://www.ucalgary.ca/pubs/calendar/current/sc-3-6.html**. It is the student's responsibility to familiarize himself/herself with these regulations. See also **http://www.ucalgary.ca/pubs/calendar/current/e-3.html**.

5. **REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY.** If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

6. **TEXTBOOK: No textbook required, Instructors notes will be used**

7. **EXAMINATION POLICY:** The examinations will take place in the computer labs (ST029) and all web resources my be used) Students are encouraged to read the Calendar, Section G, on Examinations: **http://www.ucalgary.ca/pubs/calendar/current/g.html**.

   Department Approval_____   Date____Sept 10/10_____

   Associate Dean's Approval for
   out of regular class-time activity: _____   **Date:**_____

8. **OTHER IMPORTANT INFORMATION FOR STUDENTS:**

   (a) *ACADEMIC MISCONDUCT (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under K. Student Misconduct (http://www.ucalgary.ca/pubs/calendar/current/k.html) to inform yourself of definitions, processes and penalties*

(b) ASSEMBLY POINTS in case of emergency during class time. Be sure to FAMILIARIZE YOURSELF with the information at http://www.ucalgary.ca/emergencyplan/assemblypoints.

(c) ACADEMIC ACCOMMODATION POLICY. Students with documentable disabilities are referred to the following links:
Calendar entry on students with disabilities: http://www.ucalgary.ca/pubs/calendar/current/b-1.html
Disability Resource Centre: http://www.ucalgary.ca/drc/

(d) SAFEWALK: Campus Security will escort individuals day or night (http://www.ucalgary.ca/security/safewalk/). Call **2205333** for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

(e) FREEDOM OF INFORMATION AND PRIVACY: This course will be conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, **students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page.** For more information see also http://www.ucalgary.ca/secretariat/privacy.

(f) STUDENT UNION INFORMATION: VP Academic **Phone:** 220-3911 **Email:** suvpaca@ucagary.ca.
SU Faculty Rep. **Phone:** 220-3913 **Email:** sciencerep@su.ucalgary.ca Website http://www.su.ucalgary.ca/home/contact.html.
Student Ombudsman: http://www.su.ucalgary.ca/services/student-services/student-rights.html

(i) INTERNET and ELECTRONIC COMMUNICATION DEVICE Information. You can assume that in all classes that you attend, **your cell phone should be turned off**. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

COURSE CONTENT

The course will continue to cover the tools and techniques that are used in solving problems that occur in different areas of physics. Many of the methods will be more sophisticated and more powerful than the basic ones presented in

Computational Physics I. Both the computational and the numerical methods introduced will be applied to specific physical problems in order to demonstrate how they are to be used.

1. Introduction to Function Approximation

    (a) Interpolation methods

    (b) Extrapolation methods

    (c) Cubic spline fitting

2. Root finding

    (a) Secant method

    (b) Newton-Raphson Methods

    (c) Other iterative methods

3. Linear systems

    (a) Direct Matrix methods

    (b) Iterative solutions

4. Introduction to Algebraic Computing Methods

    (a) Maple

    (b) MatLab

    (c) Other alebraic computing programmes

5. Ordinary Differential Equations

    (a) Predictor-Corrector Methods

    (b) Runge-Kutta Methods

6.. Using Random Numbers

    (a) Random number generators

    (b) Monte Carlo Methods

7.. Partial Differential Equations

    (a) Hyperbolic (Wave) Equations

    (b) Parabolic (Diffusion) Equations

    (c) Elliptic (Potenial) equations