

## CHM6850 (sect. 16HG) — Special Topics in Physical Chemistry/EPR Spectroscopy — Spring 2019

Lecture/lab course covering selected topics of current interest in physical chemistry. This course specifically covers the basic theory and selected applications of cw and pulsed EPR spectroscopy. Successful completion of the course will allow the student to design their own experiments and operate the various EPR spectrometers in the Chemistry Department on their own.

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|------------|---|
| Instructor | Dr. Alexander Angerhofer  |
| Phone      | 392-9489 (office, CLB318A), 392-0541 (office, LEI214A), or 392-2123 (lab, CLB303) |
| E-mail     | <a href="mailto:alex@chem.ufl.edu">alex@chem.ufl.edu</a>                          |
| O.H.       | M-9, W-9, and R-9 (4:05pm-4:55pm), in LEI214A and by appointment. <sup>1</sup>    |

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| Class Meeting Times         | During January: T-2+3 (8:30am-10:25am), rest of the term: T-2 (8:30am-9:20am)   |  |
| Class Location              | Lectures will be held in FLI109, labs in CLB303, CLB416, and JHH110.  |  |
| Lab Meeting Times           | During February-April: lab meeting times depend on lab groups as follows:<br>Group 1: M3-5 (9:35am-12:35pm)<br>Group 2: M6-8 (12:50-3:50pm)   |  |
| Holidays                    | 01/21 (MLK Day), 03/04-08 (Spring Break), 04/25-26 (Dead Week, no classes).   |  |
| Class Text                  | Instructor's manuscript (can be downloaded from canvas)<br>optional text: John A. Weil, James R. Bolton: Electron Paramagnetic Resonance: Elementary Theory and Practical Applications, Wiley-Interscience; 2nd Edition, New York, 2007, ISBN-13: 978-0471754961.   |  |
| Homework                    | Homework may be assigned. It is optional and won't be graded but may be discussed in class and will help in the student's understanding of the material.  |  |
| Points Earnable             | 8 lab reports at 10 points each for a total of 80 points. <sup>2</sup><br>1 final practical exam valued at 100 points.<br>Max. 20 participation points, earned during lecture classes (see further explanation).<br>Total points earnable: 200 for graduate students, 170 for undergraduate students.   |  |
| Grading Scheme <sup>3</sup> | Graduate Students:<br>A: $\geq 170$ pts. (85%)<br>170 pts > A- $\geq 164$ pts. (82%)<br>164 pts > B+ $\geq 158$ pts. (79%)<br>158 pts > B $\geq 150$ pts. (75%)<br>150 pts > B- $\geq 144$ pts. (72%)<br>144 pts > C+ $\geq 138$ pts. (69%)<br>138 pts > C $\geq 130$ pts. (65%)<br>130 pts > C- $\geq 124$ pts. (62%)<br>124 pts > D+ $\geq 118$ pts. (59%)<br>118 pts > D $\geq 110$ pts. (55%)<br>110 pts > E. | Undergraduate Students:<br>A: $\geq 145$ pts. (85%)<br>145 pts > A- $\geq 139$ pts. (82%)<br>139 pts > B+ $\geq 134$ pts. (79%)<br>134 pts > B $\geq 128$ pts. (75%)<br>128 pts > B- $\geq 122$ pts. (72%)<br>122 pts > C+ $\geq 117$ pts. (69%)<br>117 pts > C $\geq 111$ pts. (65%)<br>111 pts > C- $\geq 105$ pts. (62%)<br>105 pts > D+ $\geq 100$ pts. (59%)<br>100 pts > D $\geq 94$ pts. (55%)<br>94 pts > E. |

1 M-9, W-9, R-9 are departmental seminar slots. Office hours may be canceled when outside guest speakers are scheduled.

2 Undergraduate students only need to submit 5 out of 8 lab reports. These lab reports will be specifically assigned by the instructor. Labs for which no lab reports are due still have to be taken. All other course requirements remain the same.

3 see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> for more info on UF grade policies.

### Further Important Information:

- 1. Overview and Goals:** CHM6580 is a one-semester graduate level course on electron paramagnetic resonance spectroscopy designed for 1st or 2nd year graduate students who desire to use EPR in their research work at UF. The course has a theoretical part which will be discussed in the lecture part of the course, held in January 2013 during 2 periods per week, and during 1 period per week in the remaining part of the term. The laboratory part of the course incorporates 10 distinct EPR experiments which are carried out weekly during the remainder of the term. The outcome of this course ideally will be that the student will A) understand the quantum mechanical principles behind magnetic resonance, B) know how to interpret EPR spectra which also includes the ability to simulate them using appropriate software, and to extract the magnetic parameters from these simulations. C) Moreover, the student will know how to design, set up, and carry out EPR experiments without supervision, specifically on the Elexsys E580 in CLB303, the Elexsys E500 in CLB416, and the Magnostech 5000 in JHH110. D) The student will know the “insider language” of magnetic resonance and be able to read and understand the relevant literature, and E) be in a position to develop his/her own research projects using EPR spectroscopy.
- 2. Exam Policy:** The course only has one final exam which accounts for 50% of the grade (59% for undergraduate students). This exam is a practical exam in the lab. The student will have to make appropriate arrangements with the instructor and set aside two hours during exam week during which he/she will come to the lab and demonstrate competence with the EPR experiment. The student will be given an unknown sample. He/she will have to turn on the instrument correctly, tune it with the sample in the resonator, take a spectrum with a reasonably good signal-to-noise ratio, explain the meaning of the spectrum to the instructor, identify the paramagnetic center(s) in the sample based on the spectrum, and turn the instrument off correctly.
- 3. Canvas:** Access your Canvas e-learning account by clicking on the ‘Log-In to E-Learning’ link on the web site, <http://lss.at.ufl.edu/> where you will have to supply your Gatorlink credentials to log in. Please, do this at your earliest convenience and make yourself familiar. Canvas will be primarily used by TAs and the instructor to communicate with the class. Please make sure to monitor the announcements on a regular basis. There may occasionally be assignments on Canvas that need to be completed before class. If you experience technical problems when using Canvas, *e.g.*, during an online quiz, please contact the UFIT helpdesk (<http://helpdesk.ufl.edu/>, 352-392-4357 M-F from 8:00am till 5:00pm, email [helpdesk@ufl.edu](mailto:helpdesk@ufl.edu), or go to: <http://helpdesk.ufl.edu/e-learning-support/>).
- 4. Prerequisites:** There are no formal prerequisites for graduate students to take this course. Undergraduate students will need the instructor's permission to sign up for the course. This will be granted based on a personal evaluation by the instructor. Typically, undergraduate students would want to enroll if their research involves EPR spectroscopy and if they have had some background in quantum mechanics. Background in quantum mechanics can be demonstrated by either a minimum grade of 'C' in CHM4412 or CHM6470, a minimum grade of 'B' in CHM3400, or a minimum grade of 'A' in CHM2047.
- 5. Expected Work Load and Study Habits:** The course is a demanding graduate level course. Quantum mechanics is the foundation to understanding magnetic resonance, and this foundation will be laid during the first few weeks in the course. Prior background in quantum mechanics (see above) is necessary to be able to follow the lectures. If need be, the student will have to supplement his/her own understanding from other sources (internet, textbooks, review articles, *etc.*). The lab portion of the course will require a sustained effort in preparing for the labs and working on laboratory reports afterward. Each lab will include some pre-lab work that may be quizzed when you show up for lab. If you do not have a clue about what is going on you will be sent back to study and may have to do a make-up lab instead. Lab reports typically will be between 2 and 4 typed pages long and include a brief introduction to the lab, a clear description of the laboratory activities and the materials and methods used, a section describing the data received using tables and/or graphs as appropriate, a brief discussion of the experimental results, and a short paragraph with conclusions. All

lab reports will have to be typed and submitted via the canvas interface as pdf documents. The filename should include the lab number and your name in order to aid in grading and archiving your work. Undergraduate students will be expected to submit five out of ten lab reports while graduate students are expected to submit all ten lab reports. The five lab reports will typically be spaced out biweekly but may be specifically assigned by the instructor based on a student's research needs.

6. **Collaboration:** Collaboration between students on both the theoretical and the lab components of this class is encouraged. Specifically, you may work out your lab data analysis together with other students in the course. However, the final lab report needs to be your own work and may not be plagiarized. Please refer to the student honor code for further clarification:  
<http://www.dso.ufl.edu/sccr/honorcodes/honorcode.php>.
7. **Participation Grade:** The participation points (up to 20) will be earned through active participation in class. 20 total participation points are available and are assigned based on a student asking questions during lectures (and labs) or answering a question the instructor asks during lecture or lab.
8. **Class Attendance:** Class and lab attendance is essential for your success in this class. If you need to miss class or lab for any reason, please get in touch with the instructor as soon as possible. There will be an option for two make-up labs at the end of the semester. For further information on UF's attendance policies which are in effect for this course, see:  
<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx> .
9. **Online Course Evaluation:** Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester. Announcements will be made to students about the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.
10. **Students with Disabilities:** Students requiring special accommodations should register with the Dean of Students Office (<http://www.dso.ufl.edu/>, 352-392-1261) and the Disability Resource Center (DRC, <https://www.dso.ufl.edu/drc>, 352-392-8565, email: [accessUF@dso.ufl.edu](mailto:accessUF@dso.ufl.edu)), and present documentation from that office to the instructor.
11. **Counseling Services:** The University of Florida provides counseling services for students, staff, and faculty. See <http://www.counseling.ufl.edu/cwc/>. If you or a friend are in distress, call (352) 392-1575 (available 24/7), email [umatter@ufl.edu](mailto:umatter@ufl.edu), or walk in for an emergency consultation during regular service hours (8:00am – 5:00pm) at the Radio Road Site, 3190 Radio Rd., or the Peabody Hall Site, on the 4<sup>th</sup> floor of Peabody Hall, adjacent to Criser Hall. For other hours or weekends, call the Alachua County Crisis Center, (352) 264-6789. For sexual assault recovery services call the Student Health Care Center at (352) 392-1161. For life-threatening emergencies always call 911.
12. **Emergency Numbers and Web Sites:**
  - UFPD (UF Police Department): In case of emergency dial 911. The UF campus police non-emergency number is (352) 392-1111. Their web site: <http://www.police.ufl.edu/>,
  - UF Emergency management: (352) 273-2100. <https://emergency.ufl.edu/>,
  - Infirmary (student health center): (352) 392-1161, <http://shcc.ufl.edu/>.
  - EH&S (Environmental Health & Safety): (352) 392-1591, <http://www.ehs.ufl.edu/>.
13. **Other Academic Resources:** UF provides several other resources for students, such as
  - Library Support can be obtained here: <http://cms.uflib.ufl.edu/ask>, where you can find various ways to receive assistance with respect to using the libraries or finding resources.
  - The Career Resource Center is located on level One in the Reitz Union, (352) 392-1601, and provides career assistance and counseling. Refer to <http://www.crc.ufl.edu/> for further info.
  - The Teaching Center is located in Broward Hall, main phone (352) 392-2010 or appointment phone (352) 392-6420, and provides students with tutoring services and counseling regarding general study skills. Refer to <http://teachingcenter.ufl.edu/> for further info. It may also provide employment opportunities as tutors for well qualified students.
  - The Writing Studio is located at 302, Tigert Hall, (352) 846-1138, and provides help with

brainstorming, formatting, and writing papers, see: <https://writing.ufl.edu/writing-studio/>.

- The Ombuds Office is located at 31 Tigert Hall, (352) 392-1308, and provides students assistance in resolving problems and conflicts that arise in the course of interacting with the University of Florida. By considering problems in an unbiased way, the Ombuds works to achieve a fair resolution and works to protect the rights of all parties involved. For further information go to <http://www.ombuds.ufl.edu/> or refer to the official complaints policy here: [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

14. **Honor Code:** This class will operate under the policies of the student honor code which can be found at: <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>. The students, instructor, and TAs are honor-bound to comply with the Honors Pledge: **We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.** You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."* It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks. Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>.
15. **Disclaimer:** This syllabus represents my current plans and objectives. If those need to change as the semester progresses, then the changes will be communicated to the class clearly.

If you have further questions, please contact me. Have a great semester!

Sincerely Yours,

Alexander Angerhofer  
(Dr. A)