

BAEN 655-600, PRINCIPLES of MODERN OPTICAL SPECTROSCOPY  
 Fall 2019  
 Lecture TR 9:35-10:50 SCTS 215

### Course Description and Prerequisites

Optical spectroscopic techniques-their principles, based on the fundamentals of electromagnetism, interaction of light with matter and modern physics; Laser Induced Fluorescence; fluorescence correlation spectroscopy—single molecule spectroscopy; Raman spectroscopy; optical coherence tomography; low coherence speckle interferometry; optical tweezers; imaging and microscopy beyond diffraction limit

Prerequisites— Graduate classification

### Course Objectives

This course will cover many of the optical spectroscopic techniques, which have found applications far beyond the discipline of Physics. One such technique is The Raman spectroscopy and its variations, which have proved to be a very effective tool not only in Physics and Chemistry but also in Biology and other fields. In all applications, light has to interact with matter of whatever origin. Thus, the major objectives will be understanding of light–matter interactions; the basic principles for different spectroscopic techniques; the kind of system information one can obtain from such methods.

### Instructor Information

Name                      Girish S Agarwal  
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 Office hours              By email request  
 Office location          PHYS 574, Mitchell Physics Building

### Textbook and/or Resource Material

W Demtroder—Vol 1-Basic Principles; Springer and Vol 2-experimental Techniques; Springer  
 W W Parson-Modern Optical Spectroscopy; Springer; and many review articles which will be made available.

### Grading Policies

Grading	Grading Scale	
Homework	50%	90 – 100: A
Midterm	20%	80 – 89: B
Final/term paper	30%	70 – 79: C
		60 – 69: D
		Below 60: F

Since this is new interdisciplinary course and students will come from different Background, a more flexible approach towards grading would be taken.

**Homework:** Late homework will not be accepted unless the student has a University excused absence or given permission from the instructor to turn it in late, for the class period in which homework was

scheduled for completion. If any assignments are turned in outside of class, you should hand it directly to the instructor.

**Exams** There will be two in-class exams during the semester. Make up exams will only be given for students with a certified medical excuse or prior instructor approval. *Instructors will work with those students enrolled in the course via Distance Education programs to determine appropriate exam dates.*

Excuses for emergency absences must be reported to the instructor as soon as possible, but not more than one week after the return to class. See University Rules for a full statement of the University attendance policy at <http://student-rules.tamu.edu/rule07>.

*This course has been assigned three credit hours based upon the work represented by verifiable achievement of institutionally established learning outcomes, direct faculty instruction, and academically engaged time. (Federal Rule GEN 11-06)*

**Course Topics, Calendar of Activities, Major Assignment Dates**

Week	Notes	Contact Hours for DE
1	Fundamentals of Electromagnetic Theory	9
2	Absorption Spectroscopy	9
3	Laser Induced Fluorescence, Correlation Spectroscopy—	9
4	single molecule spectroscopy; Raman spectroscopy	9
5	Raman spectroscopy	9
6	<b>Midterm Exam</b> ; Nonlinear spectroscopies-CARS	9
7	Nonlinear spectroscopies-FAST CARS	9
8	Localized Plasmons and sensors	9
9	Surface enhanced Raman Spectroscopy	9
10	Tip enhanced Raman Spectroscopy	9
11	Laser Induced Breakdown Spectroscopy and LIDAR	9
12	Optical Tweezers	9
13	Imaging: diffraction limit and beyond	9
14	Imaging: diffraction limit and beyond	9
15	<b>Final Exam</b>	9

**Total hours 135**

*Student contact hours: 45 for face-to-face vs 135 hrs for distance delivery for a 3 credit hour course. The 135 hrs for distance delivery will consist of watching lecture recordings and other demonstrations, reading and homework assignments, online discussions and other Q&A forums, and chatting with class instructor.*

## **Americans with Disabilities Act (ADA)**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit <http://disability.tamu.edu>.

## **Academic Integrity**

*For additional information please visit: <http://aggiehonor.tamu.edu>*

*“An Aggie does not lie, cheat, or steal, or tolerate those who do.”*