GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3173912
Semester – VII
Subject Name: MOLECULAR SPECTROSCOPY AND ITS APPLICATIONS

Type of course: Material Technology

Prerequisite: Basic knowledge of Chemistry, Nano synthesis and Material Science

Rationale: This is an introductory course on molecular spectroscopy aimed at providing students the skills needed to begin an analysis and the subsequent interpretation of molecular structure from spectroscopic data.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Content:

6	**Content**	**Total Hrs**
1	Advanced techniques in infrared and Raman spectroscopy reflection measurements attenuated total reflection thin films polarization measurements rapid scan step scan 2-D vibrational spectroscopy	**11**
2	Applications of the vibrational spectroscopy Experimental measurements: solids, liquids, interfaces polymer chemistry chemistry of dyes and coatings characterization of materials application of vibrational spectroscopy in biochemistry, medicine, biophysics and pharmacy characterization of hydrogen bonding structure and dynamics of proteins structure and dynamics of DNK molecules structure and dynamics of amphiphilic molecules application of vibrational analysis in analytical and food chemistry	11

3	Advanced methods of high resolution NMR spectroscopy multidimensional pulse sequences study of macromolecules study of conformational flexible molecules study of intermolecular interactions application of NMR spectroscopy in structural organic and medical chemistry application of the NMR spectroscopy in pharmaceutical industry	10
4	Fluorescent spectroscopy Introduction to Fluorescence Instrumentation for Fluorescence Spectroscopy Fluorophores Time-Domain Lifetime Measurements Frequency-Domain Lifetime Measurements	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	**35**	**35**	**-**		

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

References:

1. CHALMERS J. M. and GRIFFITHS P.R., Handbook of Vibrational Spectroscopy Vol.I-V, Wiley & Sons, LTD, Chichester, 2002.
2. NAKAMOTO K., Infrared and Raman Spectra of Inorganic and Coordination Compounds, Wiley, New York, 1997.
3. PERKAMPUS H.H., UV-VIS Spectroscopy and Its Applications Springer-Verlag, 2002.
4. LAKOWITZ J. R., Principles of Fluorescent Spectroscopy Kulwer Academic/Plenum Publisher, 1999.
5. DEWEY T.G., Biophysical and Biochemical Aspects of Fluorescencence Spectroscopy Plenum Press, 1991.
6. Principles of Fluorescence Spectroscopy Authors: Lakowicz, Joseph R.

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Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	students learn the principles of infrared and Raman spectroscopy.	25%
CO-2	They acquire basic knowledge about the application of the modern spectroscopies and techniques in practice	25%
CO-3	Describe aspects associated with NMR spectroscopy	25%
CO-4	Describe aspects associated with Fluorescent spectroscopy	25%