



C. U. SHAH UNIVERSITY



**C. U. SHAH UNIVERSITY
WADHWAN CITY
FACULTY OF SCIENCES**

M.Sc.

CHEMISTRY

SEM-IV

**Syllabi (CBCS) of
M.Sc. Chemistry
WEF June-2016
(Specialization:
Analytical
Chemistry)**



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: M.Sc.

SEMESTER: IV

SUBJECT NAME: Bio-Analytical Chemistry

SUBJECT CODE: 5SC04BAC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1.5	70	3	--	--	--	100	

Objectives:-

- To understand analytical chemistry.
- To learn clinical and drug chemistry
- To learn Clinical and Regulatory Aspects of Drug Discovery

Prerequisites:-

- Before studying analytical Chemistry, all students have basic knowledge of medicinal, clinical chemistry drug discovery and knowledge related to UG level chemistry.

Course outline:-

Sr. No.	Course Contents
1	Clinical Chemistry Composition of blood, collection and preservation of samples, common determinations- serum electrolytes, blood glucose, blood urea nitrogen, uric acid, albumins and globulins, acid and alkaline phosphatases, barbiturates. Principles
2	Analytical Aspects of Drug Discovery Discovery of new chemical entity, Identity and purity assessment, bioavailability/dissolution requirement, high-throughput screening, degradation and impurity analysis of drug substances, residual solvent and its classification, stability studies, pre-formulation studies, method development and validation.
3	Clinical and Regulatory Aspects of Drug Discovery Clinical trials - Phase I, II, III and IV. Quality control and quality assurance. Regulatory considerations, regulatory compliance, International Conference on Harmonization (ICH) classification and FDA guidelines, global CMC NDA.



4	Bioanalysis Components of bioanalytical methodology: extraction from biological matrices, chromatography and detection systems. Bioanalytical method validation parameters: sensitivity, selectivity, accuracy and precision, linearity (calibration curves), recovery, matrix effect and stability. Bioavailability and bioequivalence study, incurred sample reanalysis test for subject samples. USFDA guidelines for bioanalytical method validation and the acceptance criteria.
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Learning Outcomes:-

After the successful completion of the course, students will be able to understand,

- Bio analysis by bio analytical methodology
- Clinical trials - Phase I, II, III and IV and FDA, CMC, NDA and ICH.

Books Recommended:-

1. "Quantitative Chemical Analysis" by **Daniel C. Harris**, *W.H. Freeman and Company*.
2. "Analytical Chemistry" by **Gary D. Christian**, *John Wiley*.
3. "Principles of Instrumental Analysis" by **Douglas A. Skoog**, *Holt-Saunders International Editions*.
4. "Handbook of Modern Pharmaceutical Analysis" by **Satinder Ahuja**, *Academic Press*.
5. "Handbook of Modern Pharmaceutical Analysis" by **Lena Ohannesian**, *Marcel Dekker Inc.*,
6. "Quantitative Analysis of Drugs in Pharmaceutical Formulation", **P.D. Sethi**, *CBS Publishers*.
7. "Bioanalytical Chemistry" by **S. Mikkelsen**, *John Wiley and Sons*.

E-Resources:-

- <http://analyticalchemistry.about.com/od/medicalhealth/>
- <http://www.drugdiscoverytoday.com/category/210/medicinal-chemistry/>
- <http://en.wikipedia.org/wiki/analyticalchemistry/>



FACULTY OF SCIENCES

DEPARTMENT OF CHEMISTRY

COURSE: M.Sc.

SEMESTER: IV

SUBJECT NAME: Quantitative Optical Spectroscopic Methods-II

SUBJECT CODE: 5SC04QSC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
4	0	0	4	4	30	1.5	70	3	--	--	--	100

Objectives:-

- To understand concept of spectroscopy and spectrometry.
- To get idea about Atomic Emission Spectroscopy.
- To understand applications of Atomic Fluorescence Spectroscopy

Prerequisites:-

Before studying spectroscopic techniques, all students have basic knowledge of basic principles, Instrumentation and knowledge related to UG level chemistry.

Course outline:-

Sr. No.	Course Contents
1	Atomic Absorption Spectrometry <ul style="list-style-type: none">• Introduction• Basic Principles• Instrumentation• Interferences• Techniques for Quantification of Elements• Recent Developments• Applications



2	Inductively Coupled Plasma Atomic Emission Spectroscopy <ul style="list-style-type: none">• Introduction• Physical and Chemical Principles• Spectrometers• Detection, Calculation, and Output• Analytical Information : Qualitative and Quantitative• Applications
3	Atomic Fluorescence Spectroscopy <ul style="list-style-type: none">• Introduction• Physical and Chemical Principles• Instrumentation• Accuracy• Precision• Detection Limits• Analytical Information : Quantitative• Applications
4	X – Ray Fluorescence Spectrometry <ul style="list-style-type: none">• Introduction• Instrumentation• Analytical Information : Qualitative and Quantitative• Applications

Learning Outcomes:-

After the successful completion of the course, students will be able to understand,

- Analytical instrumentation Qualitative and Quantitative
- Detection limit, Accuracy and Precision

Books Recommended:-

1. "Handbook of Instrumental Techniques for Analytical Chemistry", **Frank Settle**, *Prentice Hall PTR*.
2. "Spectrochemical Analysis by Atomic Absorption and Emission", **Lajunen L H J**, *RSC*.
3. "Advances in Atomic Spectroscopy", **Sneddon J**, *JAI Press*,
4. "CRC Handbook of Inductively Coupled Plasma Atomic Emission Spectrometry", **Varma A**, *CRC Press*,
5. "Multielement Detection Systems for Spectrochemical Analysis", **Busch K W**, *Wiley*,
6. "Principles and Practice of X – Ray Spectrometric Analysis", **Bertin, Eugene**, *Plenum Press*,
7. "An Introduction to X –Ray Spectrometry", **Jenkins, Ron**, *Heyden & Sons, London*.

E-Resources:-

- http://en.wikipedia.org/wiki/Atomic_absorption_spectroscopy
- <http://www.galbraith.com/spectroscopy.htm>



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- [http://en.wikipedia.org/wiki/Inductively coupled plasma atomic emission spectroscopy](http://en.wikipedia.org/wiki/Inductively_coupled_plasma_atomic_emission_spectroscopy)
- [http://en.wikipedia.org/wiki/Fluorescence spectroscopy](http://en.wikipedia.org/wiki/Fluorescence_spectroscopy)
- <http://www.aurorabiomed.com/atomic-fluorescence-spectroscopy/>
- <http://www.andor.com/learning-academy/atomic-spectroscopy-atomic-absorption,-emission-and-fluorescence-techniques>
- <http://www.chemistry.adelaide.edu.au/external/soc-rel/content/afs.htm>
- [http://en.wikipedia.org/wiki/X-ray fluorescence](http://en.wikipedia.org/wiki/X-ray_fluorescence)
- http://serc.carleton.edu/research_education/geochemsheets/techniques/XRF.html



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: M.Sc.

SEMESTER: IV

SUBJECT NAME: Advanced Analytical Instrumentation

SUBJECT CODE: 5SC04AIC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1.5	70	3	--	--	--	100	

Objectives:-

- To understand spectroscopic techniques.
- To learn theories and principles analysis methods
- To create interest in students in learning analytical chemistry.

Prerequisites:-

- Before studying spectroscopic techniques, all students have basic knowledge of analytical chemistry, analysis methods, characterization techniques and knowledge related to UG level chemistry.

Course outline:-

Sr. No.	Course Contents
1	UHPLC and SFC Principle, theory, instrumentation and applications of ultra high-performance liquid chromatography (UHPLC) and super critical fluid chromatography (SFC). Comparison with HPLC.



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2	Advanced mass spectrometry Ion sources- matrix assisted laser desorption ionization (MALDI), thermospray, electrospray, atmospheric pressure chemical ionization (APCI), atmospheric pressure photo ionization (APPI) and atmospheric pressure secondary ion ionization (APSI); Mass analyzers- quadrupole, ion-trap, time of flight (TOF), ion-cyclotron resonance and Fourier transform mass spectrometry. Tandem mass spectrometry. Applications in the analysis of biomolecules
3	LC-NMR and LC-MS Principle, theory, instrumentation and applications of liquid chromatography-nuclear magnetic resonance and liquid chromatography-mass spectrometry. Application of LC-NMR-MS.
4	ICP-MS Principle, theory, instrumentation and applications of inductively coupled plasma-mass spectrometry.

Learning Outcomes:-

After the successful completion of the course, students will be able to understand

- Spectroscopic techniques and applications
- Structural elucidation of drug molecules based on joint application of UV,IR, PMR, CMR and mass spectroscopy.

Books Recommended:-

1. "Spectroscopic methods in organic chemistry", **D.H.Williams & Tan Fleming**.
2. "Spectrometric identification of organic compounds", **T.C.Morril, R.M. Silverstein and G.Bassler**, John Wiley and sons.
3. "Introduction to spectroscopy", **D.L.Pavia, G.M.Lampman and G.S.Kriz**, Harcourt college publishers.
4. "Organic spectroscopy", **W.Kemp**.
5. "Organic spectroscopy", **P.S.Kalsi**.
6. "Quantitative Chemical Analysis" by **Daniel C. Harris**, W.H. Freeman and Company, New York.
7. "Analytical Chemistry" by **Gary D. Christian**, John Wiley.
8. "Mass spectrometry-Principles and Applications" by **Edmond de Hoffmann**, John Wiley.

E-Resources:-

- <http://en.wikipedia.org/wiki/Spectroscopy>
- <http://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/spectrpy/spectro.htm>
- http://chemwiki.ucdavis.edu/Analytical_Chemistry/Analytical_Chemistry_2.0/10_Spectroscopic_Methods
- <http://icmab.es/spectroscopic-techniques-laboratory>



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FACULTY OF SCIENCES

DEPARTMENT OF CHEMISTRY

COURSE: M.Sc.

SEMESTER: IV

SUBJECT NAME: Dissertation/Project Work

SUBJECT CODE: 5SC04DPA1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
0	0	20	20	10	-	-	-	-	50	-	250	300	

Dissertation/Project work

1. Students should carry out a small research project. This should make them familiar with literature survey, research methodologies, Identification of products by analytical and spectral methods and familiarity with chromatographic techniques.
2. Students who are not assigned the project should carry out at least 12 experiments and students who are assigned project work should carry out at least 6 experiments to illustrate the principles of Analytical instrumentation, method development, Drug purification by GC, etc.
3. Suggested instrument for analytical based dissertation–
Gas chromatography, high performance liquid chromatography, UV-Visible spectroscopy, Spectrophotometry, spectrofluorimeter, Colorimeter, etc.