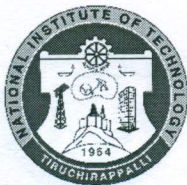




**NATIONAL INSTITUTE OF TECHNOLOGY,  
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**DEPARTMENT OF CHEMISTRY**

COURSE PLAN – PART I			
Name of the programme and specialization	M.Sc.(Chemistry)		
Course Title	Instrumental Methods of Chemical Analysis		
Course Code	CH 607	No. of Credits	3 (Theory)
Course Code of Pre-requisite subject(s)	Nil		
Session	July 2019		
Name of Faculty	Dr. V.M. Biju	Department	Chemistry
Official Email	vmbiju@nitt.edu	Telephone No.	+91-431-2503638(O) +91-9443843076(M)
Name of Course Coordinator	Dr. V.M.Biju		
Official E-mail	vmbiju@nitt.edu	Telephone No.	+91-431-2503638(O) +91-9443843076(M)
Course Type	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		
<b>Syllabus (approved in BoS)</b>			
<p><b>Errors in chemical analyses:</b> Accuracy and propagation of errors, Statistical data analysis and evaluation: Confidence intervals, statistical aids to hypothesis testing- analysis of variance and Regression analysis</p> <p><b>Unit-II</b></p> <p><b>Separation techniques:</b> Solvent extraction - Methods of extraction and applications of solvent extraction. Chromatography- thin layer chromatography, ion exchange chromatography and size exclusion chromatography –HPLC-outline study of instrument modules. Gas chromatography – basic instrumental set up-carriers, columns, detectors and comparative study of TCD, FID, ECD and NPD. Theory &amp; applications –electrophoresis- theory and applications.</p> <p>Unit-III</p> <p><b>Electroanalytical techniques:</b> Potentiometry - electrode systems, direct potentiometric titrations-null-point potentiometry and applications. polarography, stripping voltammetry &amp; Amperometric techniques - diffusion currents, Half-wave potentials, construction &amp; characteristics of the DME-quantitative analysis-amperometric titrations and applications of polarography – electrogravimetry and coulometry - coulometry at constant potential, coulometric titrations-conductometric titrations.</p> <p><b>Atomic spectrometry:</b> Atomic absorption spectrometry(AAS) - absorption of characteristic radiation, instrumentation- Hollow cathode lamp-sampling - quantitative measurements and interferences- atomic emission-instrumentation, plasma sources –instrumentation- inductively coupled plasma - mass spectrometry (ICP–MS) –principles &amp; instrumentation and applications of flame emission spectrometry - flame characteristics &amp; processes-applications of flame photometry and flame atomic emission spectrometry.</p> <p><b>Thermal techniques:</b> Thermogravimetry - instrumentation and applications of TG. Differential thermal analysis (DTA) - instrumentation and applications of DTA. Differential scanning</p>			



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calorimetry (DSC) - Instrumentation, applications of DSC and comparison of DTA & DSC. Thermomechanical analysis (TMA) and dynamic mechanical analysis (DMA) - instrumentation, applications of TMA and dynamic mechanical analysis.

**COURSE OBJECTIVES**

To introduce the basic principles, working and applications of Instrumental techniques like Chromatography, Electrophoresis, Potentiometry, spectroelectrochemistry and thermal methods to the I year M.Sc. students.

**MAPPING OF COs with POs**

Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
1. To know the importance of instrumental techniques and its applications.	1,2,3, 4,5,6,8,10
2. To understand sampling methods of the analytes to be measured.	1,2,3, 4,5,6,10
3. To get familiarize with the principles, operation and uses of these instruments in industry.	1,2,3, 4,5,6,10
4. To conduct demonstration experiments in industry with real samples.	1,2,3, 4,5,6,10
5. To know the importance of instrumental techniques and its applications.	1,2,3, 4,5,6,10

**COURSE PLAN – PART II**

**COURSE OVERVIEW**

This course is offered to I year M.Sc.(Chemistry) students. This 3 credit course is for theory. Three theory classes will be conducted per week.

**COURSE TEACHING AND LEARNING ACTIVITIES** (Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	I	<u>Unit-I</u> Terms and definitions - systematic errors and Random errors.	C&T, PPT
2	II	Statistical treatments - standard deviation of calculated results and reporting computed data.	C&T, PPT
3	III	Statistical data treatment and evaluation: Confidence intervals, statistical aids to hypothesis testing - analysis of variance and detection of gross errors.	C&T, PPT



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4	IV	<b>Unit-II</b> Solvent extraction - Methods of extraction and applications of solvent extraction. Solid phase extraction - methods and applications	C&T, PPT
5	V	Chromatography - thin layer chromatography, ion exchange chromatography and size exclusion chromatography. HPLC - outline study of instrument modules.	C&T, PPT
6	VI	Gas chromatography - basic instrumental set up - carriers, columns, detectors and comparative study of TCD, FID, ECD and NPD. Theory & applications - electrophoresis - theory and applications.	C&T, PPT
7	VII	<b>Unit-III</b> Potentiometry - electrode systems, direct potentiometric titrations - null-point potentiometry and applications - polarography, stripping voltammetry & amperometric techniques.	C&T, PPT
8	VIII	Diffusion currents, Half-wave potentials, construction & characteristics of the DME - quantitative analysis - amperometric titrations and applications of polarography.	C&T, PPT
9	IX	Electrogravimetry and coulometry - coulometry at constant potential, coulometric titrations - conductometric titrations.	C&T, PPT
10	X	<b>Unit-IV</b> Atomic absorption spectrometry (AAS) - absorption of characteristic radiation, instrumentation - Hollow cathode lamp - sampling - quantitative measurements and interferences.	C&T, PPT
11	XI	Atomic emission - instrumentation, plasma sources - instrumentation - inductively coupled plasma - mass spectrometry (ICP-MS)	C&T, PPT
12	XII	Principles & instrumentation and applications of flame emission spectrometry - flame characteristics & processes - applications of flame photometry and flame atomic emission spectrometry.	C&T, PPT



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13	XIII	<b>Unit-V</b> Elemental analysis – CHNSO thermogravimetry - instrumentation and applications of TG. Differential thermal analysis (DTA) - instrumentation and applications of DTA	C&T, PPT
14	XIV	Differential scanning calorimetry (DSC) - Instrumentation, applications of DSC and comparison of DTA & DSC.	C&T, PPT
15	XV	Thermomechanical analysis (TMA) and dynamic mechanical analysis (DMA) - instrumentation, applications of TMA and dynamic mechanical analysis.	C&T, PPT

**COURSE ASSESSMENT METHODS** (shall range from 4 to 6)

**Theory**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assignment	I week of September	One week	5
2	Test I	II week of September	60 minutes	20
3	Seminar	III week of October	One week	5
4	Test II	IV week of October	60 minutes	20
CPA	Compensation Assessment	II week of November	60 minutes	20
5	Final Assessment	I week of December	3 hours	50

**COURSE EXIT SURVEY** (mention the ways in which the feedback about the course shall be assessed)

1. Feedback from students during class committee meetings.
2. Anonymous feedback through questionnaire at the end of the semester.

**COURSE POLICY** (including compensation assessment to be specified)

**MODE OF CORRESPONDENCE (email/ phone etc):** Through mobile phone

**COMPENSATION ASSESSMENT POLICY**

1. This assessment is for those students who missed Test I or Test II due to genuine reasons
2. Compensation assessment will be conducted during the II week of November 2019.



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**ATTENDANCE POLICY** (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

**ACADEMIC DISHONESTY & PLAGIARISM**

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

**ADDITIONAL INFORMATION, IF ANY**

The faculty will be available for consultation at times as per the intimation by the faculty.

**FOR APPROVAL**

Course Faculty 

CC- Chairperson 

HOD 



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**Guidelines**

- a) The number of assessments for any theory course shall range from 4 to 6.
- b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.