



NATIONAL INSTITUTE OF TECHNOLOGY,  
TIRUCHIRAPPALLI

DEPARTMENT OF CHEMISTRY

| COURSE PLAN – PART I  |   |                |   |
|---|---|----------------|---|
| Name of the programme and specialization  | M.Sc.(Chemistry)  |                |   |
| Course Title  | Lanthanide and Actinide Chemistry   |                |   |
| Course Code   | CH 634  | No. of Credits | 3 (Theory)                              |
| Course Code of Pre-requisite subject(s)   | Nil   |                |   |
| Session   | July 2019   |                |   |
| Name of Faculty   | Dr. A. Sreekanth  | Department     | Chemistry                               |
| Official Email  | sreekanth@nitt.edu  | Telephone No.  | 9489551851                              |
| Name of Course Coordinator  | Dr. V.M.Biju  |                |   |
| Official E-mail   | vmbiju@nitt.edu   | Telephone No.  | +91-431-2503638(O)<br>+91-9443843076(M) |
| Course Type   | <input checked="" type="checkbox"/> Core course <input checked="" type="checkbox"/> Elective course |                |   |
| <b>Syllabus (approved in BoS)</b>   |   |                |   |
| Lanthanides: Occurrence – Ores- Extraction and separation – The Lanthanide contraction – Electronic configuration – shapes of f – orbitals – ionization energies – simple binary compounds of lanthanides   |   |                |   |
| Lanthanides: Coordination chemistry – Coordination numbers – stability and oxidation states - Magnetic Properties – Electronic Spectra – Luminescence Spectra – NMR Applications – and Imaging- EPR Spectroscopy  |   |                |   |
| Organolanthanide Chemistry: Stability +3 oxidation state – Alkyls and aryls – Cyclopentadienyls – hydrides- other oxidation states and their organometallic complexes – carbonyl compounds of Sc-Y & Pr   |   |                |   |
| Actinides: Occurrence – Synthesis – Extraction and isolation – Characteristics of the actinides – reduction potentials – relativistic effects – binary compounds of actinides – coordination chemistry of actinides – stability – structure and coordination number |   |                |   |
| Actinides: Electronic and magnetic properties of actinides – spectra – Organoactinides – cyclopentadienyls- carbonyls – synthesis of transactinides – naming.   |   |                |   |
| <b>COURSE OBJECTIVES</b>  |   |                |   |
| The student will be able to in detail understand the chemistry and reactivity of lanthanides and actinides, their properties and applications.  |   |                |   |



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| <b>MAPPING OF COs with POs</b>                    |   |
|---|---|
| <b>Course Outcomes</b>                            | <b>Programme Outcomes (PO)<br/>(Enter Numbers only)</b> |
| 1. Learn about Lanthanides and their extraction   | 1,2,3, 4,5,6,8,10                                       |
| 2. Understand Lanthide Chemistry and spectroscopy | 1,2,3, 4,5,6,10   |
| 3. Learn about actinides and their extraction     | 1,2,3, 4,5,6,10   |
| 4. Learn about actinides and their extraction     | 1,2,3, 4,5,6,10   |

| <b>COURSE PLAN – PART II</b>   |      |  |                  |
|--|------|--|------------------|
| <b>COURSE OVERVIEW</b>   |      |  |                  |
| This 3 credit course is for theory. Three theory classes will be conducted per week. |      |  |                  |
| <b>COURSE TEACHING AND LEARNING ACTIVITIES</b>                                       |      |  | ( Add more rows) |
| S.No.  | Week | Topic  | Mode of Delivery |
| 1  | I    | Lanthanides: Occurrence – Ores-  | C&T, PPT         |
| 2  | II   | Extraction and separation – The Lanthanide contraction   | C&T, PPT         |
| 3  | III  | – Electronic configuration – shapes of f – orbitals – ionization energies – simple binary compounds of lanthanides | C&T, PPT         |
| 4  | IV   | Lanthanides: Coordination chemistry – Coordination numbers –   | C&T, PPT         |
| 5  | V    | stability and oxidation states - Magnetic Properties – Electronic Spectra –  | C&T, PPT         |
| 6  | VI   | Luminescence Spectra –   | C&T, PPT         |



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|    |      |  |          |
|----|------|--|----------|
| 7  | VII  | NMR Applications – and Imaging-<br>EPR Spectroscopy  | C&T, PPT |
| 8  | VIII | Organolanthanide Chemistry:<br>Stability +3 oxidation state – Alkyls<br>and aryls  | C&T, PPT |
| 9  | IX   | Cyclopentadienyls – hydrides- other<br>oxidation states and their<br>organometallic complexes – carbonyl<br>compounds of Sc-Y & Pr | C&T, PPT |
| 10 | X    | Actinides: Occurrence – Synthesis –<br>Extraction and isolation –  | C&T, PPT |
| 11 | XI   | Characteristics of the actinides –<br>reduction potentials – relativistic<br>effects –   | C&T, PPT |
| 12 | XII  | binary compounds of actinides –<br>coordination chemistry of actinides –<br>stability – structure and coordination<br>number       | C&T, PPT |
| 13 | XIII | Electronic and magnetic properties of<br>actinides – spectra –   | C&T, PPT |
| 14 | XIV  | Organoactinides – cyclopentadienyls-<br>carbonyls –  | C&T, PPT |
| 15 | XV   | synthesis of transactinides – naming.  | 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<br>September  | One week   | 5           |
| 2     | Test I             | II week of<br>September | 60 minutes | 20          |
| 3     | Seminar            | III week of<br>October  | One week   | 5           |
| 4     | Test II            | IV week of<br>October   | 60 minutes | 20          |



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|     |                         |                     |            |    |
|-----|-------------------------|---------------------|------------|----|
| CPA | Compensation Assessment | II week of November | 60 minutes | 20 |
| 5   | Final Assessment        | I week of December  | 3 hours    | 50 |

**COURSE EXIT SURVEY**

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.

**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

