

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF CHEMICAL ENGINEERING

| COURSE PLAN – PART I  |   |                          |                                  |   |   |   |
|---|---|--------------------------|----------------------------------|---|---|---|
| Course Title  | Particulate Science and Technology Laboratory   |                          |                                  |   |   |   |
| Course Code   | CLLR13  | No. of Credits           | L                                | T | P | C |
|   |   |                          | 0                                | 0 | 3 | 2 |
| Course Code of Pre-requisite subject(s)   | CLPC18  |                          |                                  |   |   |   |
| Session   | July 2019                                       | Section (if, applicable) | Not Applicable                   |   |   |   |
| Name of Faculty   | Dr J Sarat Chandra babu<br>Dr A Arunagiri       | Department               | Chemical Engineering             |   |   |   |
| Email   | sarat@nitt.edu,<br>aagiri@nitt.edu              | Telephone No.            | 91-431-2503107<br>91-431-2503114 |   |   |   |
| Name of Course Coordinator(s) (if, applicable)  | Dr K M Meera Sheriffa Begum                     |                          |                                  |   |   |   |
| E-mail  | meera@nitt.eu                                   | Telephone No.            | 91-431-2503109                   |   |   |   |
| Course Type   | <input checked="" type="checkbox"/> Core course |                          |                                  |   |   |   |
| <b>Syllabus (approved in BoS)</b>   |   |                          |                                  |   |   |   |
| <ol style="list-style-type: none"> <li>1. Particle Size Characterization : Particle Density, Bulk Density (Tap Density, Repose Density), Angle of Repose</li> <li>2. Settling Velocity : Evaluation of Drag and study the effect of particle diameter</li> <li>3. Screen Analysis: Evaluation of Effectiveness of a screen</li> <li>4. Comminution : Evaluation of Energy Requirement in Jaw Crusher</li> <li>5. Comminution : Influence of Flight on comminution in a Ball Mill</li> <li>6. Filtration : Evaluation of characteristics for cake and filter medium</li> <li>7. Mixing : Evaluation of Mixing Characteristics and influence of Baffles</li> <li>8. Sedimentation: Evaluation of effect of inclination on sedimentation of suspension</li> <li>9. Elutriation: Evaluation of elutriation parameters</li> <li>10. Flow Analysis in Sylo</li> </ol> |   |                          |                                  |   |   |   |
| <b>REFERENCE BOOKS</b>  |   |                          |                                  |   |   |   |
| <ol style="list-style-type: none"> <li>1. Martin J. Rhodes, "Introduction to Particle Technology" 2<sup>nd</sup> Edn., 2008 John Wiley &amp; Sons Ltd.,</li> <li>2. Lab manual and the references given by the Course Instructors</li> </ol>  |   |                          |                                  |   |   |   |
| <b>COURSE OBJECTIVES</b>  |   |                          |                                  |   |   |   |
| On completion of the course, A student can gain knowledge through conducting experiments on characterization of single particle and powder samples, particulate process such as comminution, Screen Analysis, filtration, mixing, sedimentation and Elutriation.  |   |                          |                                  |   |   |   |
| <b>COURSE OUTCOMES (CO)</b>   |   |                          |                                  |   |   |   |
| Course Outcomes   | Aligned Programme Outcomes (PO)                 |                          |                                  |   |   |   |
| 1. able to verify the fundamental concepts underlying the behavior of particulate materials   | 1,2,5,6,7,8,9,10,11,12                          |                          |                                  |   |   |   |

**COURSE PLAN – PART II****COURSE OVERVIEW**

Bulk powder material handling and multiphase gas-solid or liquid solid systems are complex and critical in many of the process industries. The different systems and characteristics have been addressed in the theory course CLPC18 Particulate Science & Technology. Determination of specific parameter of particulate system and analysis of various fluid solid systems will be addressed in this practical course.

**COURSE TEACHING AND LEARNING ACTIVITIES**

| S. No. | Week                  | Topic  | Mode of Delivery                                |
|--------|-----------------------|--|---|
| 1      | 1 <sup>st</sup> Week  | Introduction on Experiments, Grouping the students Team  | Chalk & Board, PPT, Demonstration               |
| 2      | 2 <sup>nd</sup> Week  | Particle Size Characterization (Settling Velocity, Particle Density, Bulk Density (Tap Density, Repose Density), Angle of Repose | Experiment will be carried out by the students. |
| 3      | 3 <sup>rd</sup> Week  | Drag studies of a single particle in liquid system   | Experiment will be carried out by the students. |
| 4      | 4 <sup>th</sup> week  | Screen Analysis (Evaluation of Effectiveness of a screen)  | Experiment will be carried out by the students. |
| 5      | 5 <sup>th</sup> week  | Jaw Crusher (Evaluation of Energy Requirement in Jaw Crusher, check the validity of comminution laws)                            | Experiment will be carried out by the students. |
| 6      | 6 <sup>th</sup> week  | Ball mill (Influence of Flight on comminution in a Ball Mill)  | Experiment will be carried out by the students. |
| 7      | 7 <sup>th</sup> Week  | Sedimentation (Evaluation of effect of inclination on sedimentation of different concentration suspension)                       | Experiment will be carried out by the students. |
| 8      | 8 <sup>th</sup> week  | Filtration (Evaluation of Characteristics for cake and filter medium)  | Experiment will be carried out by the students. |
| 9      | 9 <sup>th</sup> week  | Elutriation (Evaluation of elutriation parameters)   | Experiment will be carried out by the students. |
| 10     | 10 <sup>th</sup> Week | Mixing (Evaluation of Mixing Characteristics and influence of Baffles)   | Experiment will be carried out by the students. |
| 11     | 11 <sup>th</sup> Week | Flow Analysis in Sylo  | Experiment will be carried out by the students. |
| 12     | 12 <sup>th</sup> Week | Repetition and Compensation class  | Experiment will be carried out by the students. |



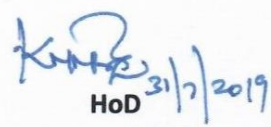
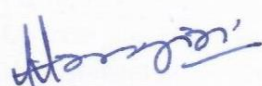
**COURSE ASSESSMENT METHODS (shall range from 4 to 6)**

| S. No. | Mode of Assessment               | Week/Date                   | Duration         | % Weightage |
|--------|----------------------------------|-----------------------------|------------------|-------------|
| 1      | Internal assessment              | Every week during lab hours | During lab hours | 60%         |
| 2      | Viva/Written examination         | Eleventh Week               | 1 hour test      | 15%         |
| 3      | Practical Laboratory Examination | Thirteenth Week             | 3 hours          | 25%         |

**\*mandatory**

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

Students indirect feedback will be collected twice during the course, one in the mid of the course and one at the end of the course on course contents, delivery etc.

|   |
|---|
| <b>COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, academic honesty and plagiarism etc.)</b>  |
| <b>MODE OF CORRESPONDENCE (Email/ phone etc) :</b> The students can contact the course teacher through Email/phone as given above.  |
| <b>COMPENSATION ASSESSMENT POLICY:</b><br>The students should get prior permission from the course teacher to do the compensation classes.  |
| <b>ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)</b><br>1. It is expected that the student must do all the experiments.<br>2. <b>At least 75% attendance in each course is mandatory.</b><br>3. <b>A maximum of 10% shall be allowed under On Duty (OD) category.</b><br>4. Students with <b>less than 65% of attendance</b> shall be prevented from writing the final assessment and shall be awarded 'V' grade.  |
| <b>ACADEMIC HONESTY &amp; PLAGIARISM:</b><br>➤ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.<br>➤ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.<br>➤ The departmental disciplinary committee including the course faculty member, Class committee 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.<br>The above policy against academic dishonesty shall be applicable for all the programmes.   |
| <b>ADDITIONAL INFORMATION</b><br>1. The results and discussions should be verified by the course teacher before writing the record book.<br>2. The students carry out the proper experiments, proper discussion of results, and discipline in the laboratory will be appreciated properly.<br>3. The passing minimum will be fixed as per the Rules and Regulations of the Institute.<br>4. The Faculty is available in the Room No. 201/105, Chemical Engineering Department.  |
| <b>FOR APPROVAL</b>   |
| <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="text-align: center;"> <br/> <b>Course Faculty</b><br/> <b>Dr J SARAT CHANDRA BABU</b> </div> <div style="text-align: center;"> <br/> <b>CC-Chairperson</b><br/> <b>Dr A ARUNAGIRI</b> </div> <div style="text-align: center;"> <br/> <b>HoD</b><br/> <b>Dr K M MEERA SHERIFFA BEGUM</b> </div> </div> <div style="margin-top: 20px; text-align: center;"> <br/> <b>Dr A ARUNAGIRI</b> </div> |

## 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>B.Tech. Admitted in</b>                        |             |   |             | <b>P.G.</b> |
|---|-------------|---|-------------|-------------|
| <b>2018</b>                                       | <b>2017</b> | <b>2016</b>   | <b>2015</b> |             |
| 35% or (Class average/2)<br>whichever is greater. |             | (Peak/3) or (Class Average/2)<br>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.