

## REQUIREMENT OF STUDENT INTERNS AUTUMN 2018

**Last date for submission of filled-n applications: 31-07-2018**

| Code  | Topic  | Required Qualifications  | Duration  | Minimum duration required | Number of Interns |
|-------|--|--|-----------|---------------------------|-------------------|
| SRJ02 | Technology for recovery of precious metals from discarded e-waste  | Pursuing M. Tech. (completed 2nd Semester) in Environment Engg. /Environment Science/ Environment Science & management /Chemical Engg  | 12 months | 6 months                  | 1                 |
| SRJ03 | Technology for Arsenic removal for safe drinking water   | Pursuing M. Tech. (completed 2nd Semester) in Environment Engg. /Environment Science/ Environment Science & management /Chemical Engg. / Water Management  | 6 months  | 6 months                  | 1                 |
| SRJ04 | Technology using rice husk ash for extraction of highly dispersible grade silica used for tyre manufacturing – An impact assessment  | Pursuing M. Tech. (completed 2 <sup>nd</sup> Semester) in Chemical Engg.   | 6 months  | 6 months                  | 1                 |
| HSC04 | Development of Automated Web based Horizon Scanning System 1.1. Grab information based on a pre-defined list of keywords with reference to SDG from 10 news papers and 10 magazines. 1.2. Store the information in DB. | M.Tech. (CSE/I.T.)<br>Desirable :<br>O.S. : Linux (Ubuntu16.04 onwards)<br>Serverside Technologies: PHP 7 / Python 3/ R<br>Javascript Frameworks : React / Angular<br>Database : MySQL / MariaDB | 12 months | 6 months                  | 4                 |
| TFR14 | Estimation of Electric Vehicle Penetration using Systems Dynamic Model   | MBA/ M.Tech (Industrial Engg, Mechanical Engg, Energy Engineering, Electrical Engg)  | 6 months  | 4 months                  | 1                 |

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| TFR15 | Foresight Study on Composites for automotive lightweighting applications and their recyclability                  | B.Tech/M.Tech in Mechanical Engg, Polymer Engg, Chemical Engg.   | 12 months | 4 months | 1 |
| TFR16 | Comparative analysis of fuel cell Electric Vehicle Vs Battery Electric Vehicle                                    | B.Tech/M.Tech in Energy Engg, Chemical Engg, Electrical Engg.  | 6 months  | 3 months | 1 |
| MAT02 | Securing Critical Resources Commensurate with the size of the country   | Completed B.E. / B.Tech or equivalent in Material Science / Metallurgy and related disciplines and pursuing Master's degree in the same.<br>Desirable : <ul style="list-style-type: none"> <li>• Good knowledge about Indian economy, export-import of minerals / materials, etc.</li> <li>• Good at data mining, information extraction, compilation, etc.</li> </ul> | 12 months | 6 months | 2 |
| TFR17 | Modeling energy demand and delivery system for the transport sector   | Pursuing BE/ B.Tech/ M.Tech in Mechanical/ Electrical/ Energy/ Transportation Engg or Environmental Science  | 12 months | 6 months | 1 |
| TFR18 | Electric Vehicle infrastructure Study - Analysis of fast charging and battery swapping including standardization. | Pursuing B.E. / B.Tech or equivalent in Electrical Engineering<br>Pursuing M.Tech in Energy Engg after B.Tech in Electrical Engg.<br><br><i>Desirable:</i><br>Knowledge in optimization tools and python programming language  | 6 months  | 4 months | 1 |

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| BBP03 | Assessment of biomass energy potential in India | Pursuing M Tech in Chemical, Mechanical or Energy Engineering, M. Sc. in Environmental Science | 6 months | 4 months | 2 |
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## 1. Technology for recovery of precious metals from discarded e-waste

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| Background/<br>Significance in brief | TIFAC-SIDBI Technology Innovation Programme (Srijan) has prioritized some recommended technologies for Impact assessment study which might be of national importance and could fit into National Missions of Govt. of India like Startup India, Make in India, Namami Gange, Swastha Bharat, Swachh Bharat etc. The titled technology is one of the technologies identified for the proposed study under Srijan. |
| Objectives                           | To make detailed report on state of art technologies available in the country for recovery of precious metals like gold, silver, copper etc.   |
| Scope of the study                   | The reports would compile information on Indian R&D labs/centers/institutions developing metal recovery technologies, Stage of Tech. Development, Tech. Transfer status, Investment cost, patent search, expected shelf life of technology etc.  |

## 2. Technology for Arsenic removal for safe drinking water

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| Background/significance in brief | TIFAC-SIDBI Technology Innovation Programme (Srijan) has prioritized some recommended technologies for Impact assessment study which might be of national importance and could fit into National Missions of Govt. of India like Startup India, Make in India, Namami Gange, Swastha Bharat, Swachh Bharat etc. The titled technology is one of the technologies identified for the proposed study under Srijan. |
| Objectives                       | To make detailed report on state of art technologies available in the country for arsenic removal for safe drinking water  |
| Scope of the study               | The reports would compile information on Indian R&D labs/centers/institutions developing arsenic removal technologies, Stage of Tech. Development, Tech. Transfer status, Investment cost, expected shelf life of technology etc.  |

### 3. Technology using rice husk ash for extraction of highly dispersible grade silica used for tyre manufacturing – An impact assessment

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| Background/<br>Significance in brief | TIFAC-SIDBI Technology Innovation Programme (Srijan) has prioritized some recommended technologies for Impact assessment study which might be of national importance and could fit into National Missions of Govt. of India like Startup India, Make in India, Namami Gange, Swastha Bharat, Swachh Bharat etc. The titled technology is one of the technologies identified for the proposed study under Srijan.  |
| Objectives                           | To collect data, prepare focused report on the technology vis-à-vis existing technologies to see impact. Also it would include tracking of some of the key game changer technologies and to look at their relative progress to deliver on similar user needs.   |
| Scope of the study                   | The study reports would include information particularly in terms of merit and value addition in products or processes vis-à-vis existing or conventional competitive technologies of silica extraction from rice husk ash. The analysis will detail into waste management by product generation, advantages of using green tyres, other applications of silica, market demand, regulatory approval for commercial scale up, availability of indigenous raw materials, IPR issues, technology shelf life etc. Information may be collected from project partners and technology developers, collection of secondary data with active interactions with various sources like R&D institutions, domain experts, industrial houses etc. The reports would also provide information on R&D labs/centers/institutions working in such areas of innovations in the country, indigenous technology source and transfer status to industries etc. |

### 4. Development of Automated Web based Horizon Scanning System

- 1.1. Grab information based on a pre-defined list of keywords with reference to SDG from 10 news papers and 10 magazines.
- 1.2. Store the information in DB.

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| Background/<br>Significance in brief | <p>Horizon Scanning is becoming increasingly important part of decision making in all sectors. It involves systematic search, requiring continuous acquisition of up-to-date information to anticipate issues, collect data with the availability of web based information.</p> <p>This project aims to present designing &amp; implementing web based automated process of Horizon Scanning System through scripting/coding based on key word search on web search engines/servers.</p> <p>By leveraging the existing infrastructure of proven search engines, this study aims to automate the human intensive process of seeking information and emerging trends, which has been so far manual.</p> |
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|                    | <p>To eliminate the repetitiveness, errors, obsolescence the whole process needs to be automated for dynamic/up-to-date information.</p> <p>A prototype application to be developed in modular way will be attempted. The following two specific areas: electronic waste management and solid waste management will be considered.</p>  |
| Objectives         | <ol style="list-style-type: none"> <li>1. Grab information based on a pre-defined dynamic list of keywords with reference to SDG from RSS feeds of 10 newspapers and 10 magazines to start with.</li> <li>2. Store the information in DB (Preferably MySQL Community Edition 5.6 onwards or MariaDB 10 onwards) hosted on server.</li> <li>3. Pull data from (a) scholars.google.com based on keywords stored in the DB in step 2 and identify technologies</li> <li>4. Search for (a) any patents on patents.google.com , and (b) products on e-commerce websites (preferably Amazon/Flipkart)</li> <li>5. Display the information based upon highest number of articles per SDG in terms of (1) Weak Signals (2) Wild Cards (3) Emerging Issues And (4) Discourse and Decision Making</li> </ol>  |
| Scope of the study | <p>TIFAC will automate the process of Web based Horizon Scanning in accordance to Sustainable Development Goals with the objectives of presenting the end user with a dashboard of news articles on raising issues, scholarly published papers, patent info, emerging/trending technologies, products available online, business intelligence and latest happenings in issues.</p> <p>In this session issues of 17 sectors and sub sectors of Sustainable Development Goals will be attempted to start with.</p> <p><i>Scope for the present session</i></p> <ol style="list-style-type: none"> <li>1. Grab information based on a pre-defined dynamic list of keywords with reference to SDG from RSS feeds of 10 newspapers and 10 magazines.</li> <li>2. Store the information in DB (Preferably MySQL Community Edition 5.6 onwards or MariaDB 10 onwards) hosted on server.</li> </ol> |

## 5. Estimation of Electric Vehicle Penetration using Systems Dynamic Model

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| Background/<br>Significance in brief | <p>Electric vehicles are making inroads into the future road transportation. Governments and many automotive players across globe have seriously been investing in developing these vehicles as alternative to conventional fossil fuel based vehicles. Hence, it is imperative to estimate penetration levels of these vehicles considering various scenarios, which will help the policy makers and other stakeholders for planning charging infrastructure, energy</p> |
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|                    | generation aspects and vehicle related R&D activities. This will also be an essential input to analyses of resource requirements for electric mobility.   |
| Objectives         | <ol style="list-style-type: none"> <li>1. To estimate electric vehicle penetration in India year wise till 2030 based on System Dynamics (SD) Modeling</li> <li>2. To develop various scenarios and drawing conclusions based data analysis using SD model</li> </ol>   |
| Scope of the study | <p>The scope of the work include :</p> <ul style="list-style-type: none"> <li>○ Collection of present and historical data related to total number of vehicles on-road, vehicle mix (categories)</li> <li>○ Identification of influencing factors/ systems for penetration of electric vehicle</li> <li>○ Technical, economical, political, social aspects</li> <li>○ Developing causal loop diagram and analysis of the cause and effect relation using open source software</li> <li>○ Drawing various scenarios on electric vehicle penetration till 2030.</li> <li>○ Analysis of fleet ownership of electric vehicles</li> </ul> |

## 6. Foresight Study on Composites for automotive lightweighting applications and their recyclability

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| Background/ significance in brief | Lightweighting of automobile has direct implications on energy consumption and CO <sub>2</sub> emissions. Materials composition, their properties, processing technologies and design aspects plays an important role in deciding their suitability for specific applications. High strength steels, aluminium and composites are considered to be potential candidates for lightweighting. Composites have high strength-to-weight ratio, have flexibility in design of automotive components and good aesthetics. |
| Objectives                        | <ul style="list-style-type: none"> <li>- To study the potential applications of thermoplastic and thermoset composites in automotive industry by 2030</li> <li>- To study the impact in terms of energy consumption and CO<sub>2</sub> emission.</li> <li>- To study recyclability issues of composites</li> </ul>  |
| Scope of the study                | <p>The scope of the work include :</p> <ol style="list-style-type: none"> <li>1. Present status of use of composites in automotive applications</li> <li>2. Identification of new components for conversion from conventional materials to composite materials, both for conventional and electric vehicles</li> <li>3. Identification of key constraints in materials, design and</li> </ol>   |

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|  | <p>fabrication point of view.</p> <ol style="list-style-type: none"> <li>4. Study research status globally on the above aspects</li> <li>5. Developing priority list of R&amp;D topics address the above issues in Indian Context.</li> <li>6. Life Cycle Analysis to estimate energy consumption and CO<sub>2</sub> emissions.</li> <li>7. Recyclability aspects and technologies to be intervened/ explored.</li> </ol> |
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## 7. Comparative analysis of fuel cell Electric Vehicle Vs Battery Electric Vehicle

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| Background/<br>Significance in brief | <p>Rising energy and environmental concerns demand green and sustainable transportation solutions. While conventional internal combustion engines use gasoline and diesel fuels, many new alternative fuels are emerging for transportation applications. These include natural gas, electric, fuel cells, hydrogen, methanol etc. However, these alternative fuels and powertrain technologies need to be assessed to understand their comparative benefits and impacts.</p> <p>The TIFAC Governing Council has advised that TIFAC should develop model on transport sector focusing on estimating how various options of transportation technologies compare in terms of meeting national commitments and targets. This study is proposed as a part of this effort.</p> |
| Objectives                           | <p>The study will focus comparison of Fuel Cell Electric Vehicle (FCEV) versus Battery Electric Vehicle (BEV) on overall life cycle perspectives and accordingly energy conversion efficiency at various stages needs to be considered.</p>   |
| Scope of the study                   | <p>The scope of the work include :</p> <ul style="list-style-type: none"> <li>• Study on various steps in the FCEV ecosystems - such as hydrogen production, transportation, fuel cell manufacturing, and fuel cell application etc.</li> <li>• Estimation of energy conversion efficiencies in each step</li> <li>• Compilation of a life-cycle inventory for FCEV and BEV with the help of data available in literature, focusing on Indian conditions</li> <li>• Lifecycle analysis of FCEV and BEV with respect to energy consumption.</li> </ul>   |

## 8. Securing Critical Resources Commensurate with the size of the country

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| Background/<br>significance in brief | "Securing Critical Resources Commensurate with the Size of the Country" has been identified as Grand Challenge 3 out of ten Grand Challenges flagged in the Technology Vision 2035 document. In the TV 2035 document, only concept of the grand challenge has been introduced briefly. A detailed study is required to understand the issue at depth and also to carve out action plan for various stake holders towards securing our critical mineral resources. The study will have two parts : Critical metals and Advanced Materials. |
| Objectives                           | A detailed study is planned involving thorough analysis of different materials in terms of their criticality with respect to the growth of the country and future technology delivery and also to carve out action plan for various stake holders towards securing our critical mineral resources.  |
| Scope of the study                   | To understand and define parameters for criticality of materials and to identify the materials critical for Indian economy. Each metal / material will primarily be studied for availability of the resource, technologies for processing / extraction / manufacturing, applications / derivatives (including alternatives available), volumes / value addition, action plan / recommendations, etc.  |

## 9. Modeling energy demand and delivery system for the transport sector

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| Background/<br>significance in brief | <p>The TIFAC Governing Council has advised that a model for transport sector should be developed with focus on estimating how various options of transportation technologies compare in terms of meeting national commitments and targets. Apart from estimating the impacts, it should also consider "nexus" or interdependence among various related sectors. This will help to describe implications of selecting a specific technology pathway.</p> <p>Energy sector and transport sector are very closely related. Although currently these two sectors are developed, operated and managed independent of one another, link between these two sectors are becoming increasingly apparent. These links could be in terms of infrastructure (e.g. electric power and electric vehicles) or mutual influences among the emerging technology alternatives to shape the future scenarios.</p> <p>Under this study it is proposed to examine this interdependence between transportation and energy sectors. This is expected to lead to development of a modeling framework by interfacing available open source models, as well as by development of suitable models as required.</p> |
| Objectives                           | <ol style="list-style-type: none"> <li>1. To develop a modeling framework for analyzing interdependence between transport and energy sectors.</li> <li>2. The study would also cover standards for battery swapping.</li> </ol>   |



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| Scope of the study | <ol style="list-style-type: none"> <li>1. Role of transportation in various energy technologies</li> <li>2. Energy requirement in various transportation technologies</li> <li>3. Identification of emerging energy and transportation technologies</li> <li>4. Study of the interdependence between transport sector and energy sector</li> <li>5. Identification of available open-source models</li> <li>6. Interfacing of the models and development of model as required</li> <li>7. The study would also cover standards for battery swapping.</li> </ol> |
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## 10. Electric Vehicle infrastructure Study - Analysis of fast charging and battery swapping including standardization.

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| Background/<br>significance in brief | Electric vehicles have received focus due to need for sustainable transportation solutions. One of the key requirements for success of electric mobility is the infrastructure for charging of the vehicle battery packs. Selecting the appropriate option depends on various aspects - such as cost of infrastructure, user convenience, time required for charging, impact on the grid, impact on the traffic flow impacts etc. Fast Charging and Battery swapping are two options for re-energizing the electric vehicles, and a systematic comparison between these two options will be an important input to the policy makers and stake holders. |
| Objectives                           | To study and compare fast charging and battery swapping options for electric vehicles  |
| Scope of the study                   | <ul style="list-style-type: none"> <li>• Study trends in fast charging and battery swapping technologies</li> <li>• Compilation and collation of data related to fast charging and battery swapping technologies and their subsystems/ components</li> <li>• Development of simulation model</li> <li>• Analysis of impacts and benefits</li> </ul>  |

## 11. Assessment of biomass energy potential in India

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| Background/<br>significance in brief | TIFAC has carried out a country-wide survey of availability of agricultural residues as surplus biomass. This includes district wise data of various types of agricultural biomass. In the present study, it is intended to collate secondary data related to characteristic of various types of biomass and based on that, estimation of biomass energy potential in various districts in the country. |
| Objectives                           | District-wise assessment of biomass energy potential based on the availability of agricultural residues and characteristics of biomass  |
| Scope of the study                   | <ol style="list-style-type: none"> <li>1. Collation of data on biomass characteristics</li> <li>2. Collation of data on available technologies for conversion of</li> </ol>   |

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|  | biomass to energy<br>3. Assessment of district-wise biomass energy potential |
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