

TIFAC Internship Programme

Requirement of Student Interns for Spring 2017-18

Date of announcement: 03 January 2018

Last date of application: 15 January 2018

Topic Code	Topic Title	Required Qualification	Duration	No of interns
ENV01	Feasibility of Air Pollution or Toxicant Removal by Identifying Certain Plant Species in Delhi Region	Pursuing M.Sc in Environmental Science or Environmental Management	6 months	1
ENV02	Augmentation of Water Resource through Treatment of Grey Water using Algal Biomass	Pursuing B.Tech in Environmental Engineering or M.Sc. In Environmental Science or Environmental Management	6 month	1

ENV01

Feasibility of Air Pollution or Toxicant Removal by Identifying Certain Plant Species in Delhi region.

Poor air qualities in Indian cities are major concern, with fine particular matter (PM_{2.5}) especially associated with serious health impacts. India suffers considerably from air pollution, having four of the top ten cities with the highest concentrations of PM_{2.5} in the world according to the World Health Organization. This particulate matter pollution is the single largest environmental health risk across the world, contributing to 4.2 million premature deaths in 2015-16. During last one decade the air qualities of city Delhi deteriorated due to excessive load of air pollutants and have adversely affecting people's health. The Delhi's air pollution could be attributed to city's transport sector, Industrial activity, burning of biomass in cooking stoves (mainly from the surrounding rural areas) and secondary inorganic aerosols which are formed from reactions of sulfur dioxide and nitrogen oxide emissions emitted by power plants, and agricultural activities in surrounding states. This demands a smart mix of measure to clean the air or reduce the load of air pollution in air in city Delhi and the surrounding states.

In order to solve Delhi's pressing air quality problem there is need address sources of air pollution. The government is working to curb the pollution loads by adopting a range of measures with major emission reduction potentials including road paving to reduce road dust emission, a rapid transition to clean cooking fuels in Delhi and its neighbouring states, and the comprehensive management of agricultural and municipal waste incorporating a ban on the open burning of waste. But such efforts have not yet yielded desired result. But at the same time using native plants play crucial role to removing air pollutants could be thought of as a low hanging fruit. The Indian tree flora comprises of

nearly 2000 species belonging to about 800 genera and 150 families of flowering plants. The plants can be used as both passive biomonitors and biomitigators in the urban-industrial environment to indicate the environmental quality and to ameliorate the pollution level in a locality. Most plants experience physiological changes before exhibiting visible damage to leaves. Some plants thrive in environments that others would find toxic, these plants can clean-up various sources of manmade pollution; both organic (petrochemical) and inorganic (heavy metal toxins). Trees remove a significant amount of pollution from the atmosphere as part of their normal functioning. They directly increase the quality of the air in the city and its surrounding area and should be considered an integral part of any comprehensive plan aimed at improving overall air quality.

The study would be carried out to assess the impact air pollution on available tree species in the certain region of city Delhi and to identify the feasible plant species in removing air pollution. The proposed study would comprise:

- The current research on feasibility of air pollution removal by using native plant species
- To understand the effect of air pollution on local plant species
- Analyzing the air pollution tolerant index various plant around the study areas
- Study of various common indigenous tree species of Delhi (minimum 10) and identification of most suitable species for toxicant removal
- Selection of plant species that have higher potential in removing air pollution including PM 10/2.5 and other criteria air pollutants defined by WHO
- Suggesting mix of plant species in study areas that will minimize the impact of air pollution or have maximum benefit in absorbing air pollutants

ENV02

Augmentation of water resource through treatment of Grey water using Algal Biomass

The issue of water security, particularly providing water adequate in quantity and of satisfactory quality, to every living being, is already a key challenge, and the situation will become increasingly grimmer in the years to come. The impact of climate change would adversely impact the availability and quality of water both for consumption of human being and irrigation purpose. This demands augmenting water availability by all affordable and viable means and recycling and reuse of domestic wastewater is one of the preferred options. It is estimated that the projected wastewater from urban centres may cross 120,000 MLD by 2051 and that rural India will also generate not less than 50,000 MLD. Currently the Indian capacity of wastewater treatment is even less than 10% of total generation which implies a huge gap in wastewater generation and its treatment in country.

Grey water is often the major component in the domestic wastewater but has fewer pollutant loads. Grey water is wastewater generated in households or office buildings from streams without fecal contamination, i.e. all streams except for the wastewater from toilets. Grey water may contain a number of chemical and physical contaminants which may impact on the health of aquatic body, plants and soils. Direct release of grey water without treatment into rivers, lakes, or estuaries results in increase of pollution/nutrients load, but its application to plants after imparting certain degree of treatment would be a valuable fertilizer. In developing countries like India, the problems associated with wastewater reuse arise from its lack of appropriate and adequate treatment. There cannot be a

one size fit all solution. Each pocket has its own unique set of challenges and hence identifying the real problem and creating customizable solutions to tackle it should be the need of the hour. The focus first should be on adaptive modern technologies that not only treats wastewater, but are also easily added-in to the existing infrastructure - thereby having a lower cost implication.

Grey water reuse and its application for various intended use is becoming a part of the fundamental solution to mitigate the water scarcity problem alongwith augmentation of water resources. Onsite grey water reuse has become widespread, with millions of treatment systems in worldwide. Once appropriately treated grey water is considered suitable for non potable purposes, mostly toilet flushing and irrigation which under certain scenarios could enrich the ground water. The grey water treatment and reuse may lower the burden on fresh water use and will reduce less strain of wastewater treatment plants significantly. Fewer amounts of energy and chemicals are required for the treatment of grey water in compare to conventional waste water treatment. Reclaiming the nutrients in grey water helps to maintain the fertility of the land. Grey water can be equated to traditional wastewater when it comes to compare the centralised to the decentralised approach to wastewater management. The reuse of grey water enables to prevent water shortage because precious and expensive water is saved. Grey water often contains valuable nutrients for gardening and irrigation and as a consequence there is no need to buy expensive mineral fertiliser. Another important fact is that people feel more responsible of their treatment system when it is decentralised and may pay more attention to the issue of grey water management.

The proposed study aims to treat grey water using algal biomass as an adsorbent which is a low cost and climate friendly option alongwith other co-benefits. In recent years, the growth and utilization of algae in many applications become very significant. So, it is expected that that adsorbent materials such as algal biomass may prove to be efficient in improving the effluent quality in terms of its physiochemical content. It is also expected that the adsorbent will significantly assist in the removal of various pollution load and improve the quality of grey water.

The treatment of grey water may contribute to an improve sanitation and promotes resources reuses for agricultural purposes. The proposed study would comprise following:

- Study of of Physio-chemical and biological characteristics of Grey water
- Identification and preparation of suitable algal biomass (different strains of algae) for the treatment of grey water
- Characterization of using Algal Biomass Adsorbent
- Adsorption Studies of both batch and column studies will be undertaken
- Study of the kinetics of adsorption on algal biomass from grey water
- Study of treated grey using algal biomass for the agricultural, domestic and horticultural application