Department of Chemical Engineering, BITS Pilani - Pilani campus

PhD admission in 2nd Semester 2017-18

1. Area(s) of PhD admission in the 2nd Semester 2017-18:

- Transport Phenomena and Separation Processes
- Chemical Reaction Engineering and Thermodynamics
- Material Science and Engineering
- Environmental Engineering
- Energy and Process Systems Engineering
- Petroleum and Petrochemical Engineering
- Biochemical Engineering

2. Scholarship/assistantship available:

   (a) Institute Assistantship Rs 20,000 per month after admission and may increase based on performance upto Rs 25000 per month

   (b) Project position(s): 04 (Details are given in the Annexure)

3. Department plans to admit student under:

   a. Full Time students: student who will devote full-time on PhD work.

   b. Part-time Students: Candidates working in organizations situated close to the campus will be admitted under this scheme. Students will have to complete required course work similar to full-time students as specified by DRC. They will not be entitled for any assistantship from the Institute.

4. Fee structure: (For the academic year 2017-18*):

<table>
<thead>
<tr>
<th>Item</th>
<th>Full-Time</th>
<th>Part-Time</th>
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</thead>
<tbody>
<tr>
<td>PhD application fees (one time)</td>
<td>2200</td>
<td>2200</td>
</tr>
<tr>
<td>Admission fees (one Time)</td>
<td>28050</td>
<td>28050</td>
</tr>
<tr>
<td>Tuition fees per semester *</td>
<td>11330</td>
<td>22660</td>
</tr>
<tr>
<td>Institute caution deposit</td>
<td>3000</td>
<td>3000</td>
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<tr>
<td>Hostel Fee, Mess &amp; electricity advance</td>
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<td></td>
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<tr>
<td>Hostel, ICT, Infra Structure Modernization Fees student aid fund</td>
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</tbody>
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*The above prescribed semester fees is for student admitted in the academic year 2016-17. For these students, the semester, term, and admission fees will be revised upward every year, but will not increase beyond 15% each year (unless the government announces any new levy/tax, which will be passed on to all existing students irrespective of their year of entry.*
Annexure

Faculty members and relevant projects open for accepting doctoral students in alphabetical order

Dr. Banasri Roy

**Project area:** Hydrogen Production from Ethanol by Low Temperature Reforming Methods Using Modified Ni-Sn/Al₂O₃ and Ni-Sn/CeO₂ Catalysts

**Project Description:**
Challenges regarding hydrogen production technology are lowering the cost of production at least by a factor of 3-4 and improving production rates. The preparation of efficient and durable catalysts to obtain high H₂ selectivity and yield is a challenging step. We are working on development of nano catalysts system for H₂ production from ethanol and biomasses. Alloying of tin to nickel engenders to higher rate of C-C bond cleavage required for higher hydrogen selectivity, while decreases the rate of methane formation from C-O bond cleavage. Al₂O₃ or CeO₂ modified with ZrO₂ and/or MgO can be used as supports. These modifiers or promoters decrease coke deposition on the catalysts and metal agglomeration. Ethanol is chosen for the present study because India is the fourth largest producer of ethanol in the world. The aqueous phase reforming (APR) has drawn particular interest because it is a single step and low temperature (≤ 225 °C) energy efficient process, which uses water-diluted oxygenated hydrocarbons directly. Likewise, low temperature steam reforming also an economical process.

**Responsibilities/Expected out come from the student:**
- Literature search on project area regularly.
- Work in laboratory (experimental) environment on designing methodology (reactor setup, preparation of catalysts, etc.)
- Conducting experiments (GC-MS, XRD, FTIR, RAMAN, DTA-TGA, FESEM, TEM, XPS etc.).
- Scientific analysis of results.
- Writing reports and documents

**Selected Publications**

Website: http://universe.bits-pilani.ac.in/pilani/broy/profile
**Dr. Bhanu Vardhan Reddy Kuncharam**

**Project area:** *Gas Separation Membranes for biogas upgradation*

**Project description:**
Biomass such as agricultural waste, landfill, sewage, and industrial waste is abundantly available in India. Biomass can be converted into biogas – a mixture of methane, carbon dioxide and other impurities – using anaerobic digestion. Biogas can be used as an energy source. The calorific value of the biogas mixture can be increased by the removal of Carbon Dioxide. Membrane systems can be used for the separation of carbon dioxide from biogas mixture. This project primary focus is developing asymmetric composite mixed-matrix membranes for removal of Carbon Dioxide from Biogas mixture under harsh conditions.

**Responsibilities/Expected Outcome from the student:**
This project involves experimental work as well as developing mathematical models for membranes. Primary responsibilities of a student are as follows:

- Screen the suitability and compatibility of polymer and inorganic filler material for CO₂ and H₂S separation from CH₄ from the literature and using various theoretical tools.
- Prepare asymmetric composite mixed-matrix membranes
- Characterize the prepared membrane using SEM, FTIR, XPS, and XRD; characterize in terms of inorganic filler dispersion, and defects (if any), modify the technique until uniform dispersion, higher filler particle loading and defect free samples are achieved.
- Conduct experiments to test the performance of the prepared membrane for the selectivity and permeation of CO₂/CH₄ separation from raw biogas in the presence of different concentrations of H₂S.
- Develop a mathematical model to predict the performance of the membrane for CO₂ removal from Biogas derived from various sources.

**Selected Publications**


Website: [http://universe.bits-pilani.ac.in/pilani/bhanuvardhan/profile](http://universe.bits-pilani.ac.in/pilani/bhanuvardhan/profile)
**Dr. Priya Sande**

**Project area 1:** CFD simulation of Geldart A particles.

**Project Description:** Use of CFD Eulerian-Eulerian modeling and simulation to explore fluidized bed regimes; with specific reference to improve the Fluidized Catalytic Cracking process. Fluidized Geldart A particles will be simulated.

**Responsibilities/Expected outcome from the student:** Student must have some skill and previous experience in CFD modeling and programming in C++, and should have done a basic petroleum course.

**Project area 2:** Experimental work with recirculating fluidized bed.

**Project Description:** The turbulent regime of a fluidized bed can be studied with a recirculating type apparatus (available). Detailed description of flow field as well as particulate structures have great significance in processes like Fluidized Catalytic Cracking. Investigation using imaging tools like Particulate Imaging Velocimetry (PIV) will be made. Geldart A particles will be fluidized.

**Responsibilities/Expected outcome from the student:** Student must have prior experimental experience preferably with fluidized beds, or at least with any particle based system.

**Selected Publications**


Website: http://universe.bits-pilani.ac.in/pilani/priya/profile
Dr. Srinivas Appari

**Proposed title:** Multi-functional catalysts for hydrogen production from renewable energy sources

**Project Description:**
To design high performance catalysts in terms of selectivity, activity and resistance to deactivation, understanding the factors affecting the performance is important. Multi-functional catalysts will be developed and used for the renewable feedstock reforming. Since the reforming process involves high temperatures, it is required to develop the catalysts with increased life at high temperatures and also the sulfur resistant catalyst since H₂S is present as an impurity in the feedstock. So, developing a catalyst which resists deactivation at high temperatures is essential. Keeping in view the additional advantages associated with multi-functional catalysts, motivated to work on development of this type of catalysts for hydrogen production by various reforming techniques.

The experimental studies are further explored to develop a detailed kinetic model for multi-functional catalysts. A multi-scale modeling approaches are used to develop the catalytic reactor.

**Responsibilities/Expected out come from the student:**
- Experimentation on reforming of renewable feed stocks
- Catalysts preparation and characterization techniques
- Softwares: Density functional theory, CFD, CHEMKIN, DETCHEM
- Operating system: LINUX
- FORTRAN/ C++ programming

**Selected Publications**

Website: http://www.bits-pilani.ac.in/pilani/srinivasappari/profile