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INTRODUCTION

The Faculty of Engineering at BUE is embarking on a new stage of its development, whereby, it is now of the utmost importance to extend its resources, facilities and expertise to support the industry and the community at large. The Faculty is emphasizing its role towards the community through engagement in a dialogue that would provide collaboration schemes and partnerships to help foster innovative solutions to persisting industrial challenges.

The Faculty is aiming at launching multifaceted professional dialogue with potential industrial partners, which would engage both sides in a fruitful collaborative scheme. In addition, the Faculty is aiming at identifying a range of services that could be offered to the community in light of its current expertise.

This catalogue is intended to provide a comprehensive description of current expertise, knowledge transfer technical workshops and testing facilities that are useful in a range of industrial applications.

The catalogue is structured in four main sections outlining the faculty expertise and industrial capacity in addition to presenting a range of industrial engagement schemes that are designed to establish and maintain close interaction with the industrial community. Finally, this catalogue should be viewed with its supplement catalogue “Faculty of Engineering Academic Staff Capacity”
VISION & MISSION

VISION
“To be a focal point of knowledge, solutions, facilities and consulting services to the engineering industry and the community across a broad subject range.”

MISSION
“To offer high quality expertise to stimulate and support demand for innovative solutions, knowledge transfer and collaboration in support of economic development.”
Faculty of Engineering Industrial Capacity Catalogue

Faculty Resources & Capacity

The Faculty of Engineering (FoE) houses six active departments, in addition to a basic sciences service department. All engineering departments offer a wide range of industrial, applied and consulting expertise that are available for the engineering community to help address industrial challenges.

The collective expertise range from analysis and design of standard engineering projects to the employment of state-of-the-art technologies in modelling complex engineering problems.

Multi-disciplinary teams are trained to work in harmony in order to analyse cross boundary engineering systems.

The Faculty offers its expertise through a range of engaging mechanisms such as knowledge commercialization, knowledge transfer and providing comprehensive testing services through its state-of-the art testing facilities.
Knowledge Commercialization

The Faculty of Engineering at the BUE offers a wide range of consultancy expertise that are expected to provide innovative solutions to industrial challenges in the six areas of specializations currently emphasized within the faculty. Such consulting services are available to industrial partners and the community at large through one of the engagement schemes discussed in the following sections. The expertise range from the analysis and design of regular engineering projects to the employment of state-of-the-art technologies in addressing multidisciplinary complex engineering problems.
The engineering departments offer the following range of consulting services:

**ARCHITECTURAL ENGINEERING**
- Post Occupancy Evaluation of Buildings in use;
- Spatial analysis of Buildings, Urban Spaces and Cities using space syntax;
- Urban & Heritage Conservation;
- Environmental Simulation;
- Acoustical Analysis;
- Urban Design / Planning;
- Socio, Behavior studies & enthuises in work place & open space;
- Environmental Impact Assessment;
- Sustainable Design;
- Ecological urban & landscape design.

**CHEMICAL ENGINEERING**
- Qualifications for accreditation to ISO management systems;
- Environmental remediation;
- Simulation of urea plants, steam reforming plants and Polystyrene plants;
- Modeling, simulation and optimization of Direct Reduced Iron Plants;
- Energy Conservation in Cement industry.

**CIVIL ENGINEERING**
- Analysis & Design of lateral load resisting systems;
- Analysis of Floor vibrations, lateral drifts and deflections;
- Evaluation of existing structures;
- Design, Review and Evaluation of pre-stressed and post-tensioned concrete structures;
- Innovative and sustainable construction materials;
- Development of special steel connections;
- Design and review of steel structural systems;
- Parametric investigation of soil profiles;
- Stability of slopes and ground water evaluation;
- Analysis of soil-structure interaction problems;
- Reliability assessment of structural elements and systems;
- Analysis & Design of smart structural systems.
**Electrical Engineering**

- Design and Optimization of:
  - a. Antennas Systems for various applications;
  - b. RF/Microwave Front-Ends for Various applications;
  - c. RF/Microwave Resonators and Filters;
  - d. Advanced reconfigurable radio systems, including antennas, filters and RF Front-Ends;
  - e. Ground-Penetrating Radar RF Front-End;

- Optimization of special radio links;
- Design of low voltage and medium voltage Networks;
- Design of light current systems (Fire Alarm, Surveillance Systems);
- Measurements of Electromagnetic field exposure and determination of hot areas.

**Mechanical Engineering**

- Control & Instrumentation Solutions for Industrial Plants;
- Hydraulic and Pneumatic Control;
- Installation and Commissioning of Boilers, Heat Exchanger and Engines;
- Fuel Combustion;
- Machinery Failure Analysis;
- Mechanical Design of Machinery;
- Material Characterization;
- Water Desalination;
- Lean Manufacturing;
- Lean- Six Sigma;
- Maintenance & Material Management.

**Petroleum Engineering**

- Reservoir characterization & Simulation;
- Reserves estimation;
- Well stimulation;
- Well logging interpretation;
- Enhanced oil recovery;
- Production optimization;
- Surface production facilities;
- Corrosion Control & Monitoring;
- Health, Safety & Environmental Management;
- Fire & Explosion Hazard Management;
- Geological Hazards.
KNOWLEDGE TRANSFER

One of the important modes of community service is knowledge transfer through training workshops that are directed towards practicing engineers. Such workshops are intended to keep engineers up-to-date with recent developments in their profession. In addition, such workshops would provide a method for expanding the professional backgrounds of practicing engineers. The Faculty of Engineering at BUE holds the necessary expertise to offer a wide range of such training workshops.
The engineering departments offer the following range of training workshops:

**ARCHITECTURAL ENGINEERING**
- Parametric modeling;
- Post Occupancy Evaluation;
- Spatial Analysis of Architectural and Urban Spaces;
- Environmental Simulation and Analysis using ECO-Tect;
- Sketching, Water coloring and visual design;
- Green Architecture & Sustainability;
- Modern Trends in Architecture Design;
- Façade, New Building Materials and Contemporary finishes;
- Environmental Impact Assessment;
- Acoustics and noise control;
- Aural Architecture and Soundscape;
- Zero Energy Communities.

**CHEMICAL ENGINEERING**
- Corrosion Protection;
- Awareness and internal audit of ISO management systems;
- Design and operation of ammonia and urea plants;
- Natural Gas Processing;
- Petroleum refinery operations;
- Energy Conservation in the chemical industries;
- Fundamentals of desalination.

**CIVIL ENGINEERING**
- Lateral loads & Lateral Load Resisting Systems;
- Pre-stressed Concrete Design;
- RC Design using EC2 and ACI;
- Surveying Equipment Training workshops;
  - Total Station;
  - GPS Equipment;
  - GIS Equipment;
- Geotechnical Equipment Training;
- Soil Testing for site engineers and consultants;
- Structural Reliability Assessment;
- Smart Structural Systems.
**Electrical Engineering**

- Antenna Design and Optimization;
- Advanced Microwave Resonator/Filters design;
- Advanced Techniques for Reconfigurable Microwave Filters and Antennas;
- RF/Microwave Front-End Architecture Design and Optimization;
- Ground-Penetrating Radar RF front-End Design;
- Reconfigurable RF Front-End, Antennas and RF Filters;
- Use of Simulation Software HFSS in Electromagnetic problems;
- Power System Design & Analysis;
- Electrical Safety;
- Safety issues in Low Voltage Installations;
- Transformer Operation & Maintenance;
- Supervision of execution of overhead lines networks;
- Safe Operation & Maintenance of circuit breakers and switchgear;
- Type & Care of overhead lines tools.

**Mechanical Engineering**

- Reactive Power Control in Factories;
- Inventory Control;
- Manual Assembly Systems;
- ISO- Quality Management Standards;
- Operation Management;
- Six Sigma;
- Planning and Control of Maintenance Processes;
- Statistical Quality Control;
- Design of Jigs and Fixture for Production Lines;
- Machinery Failure Analysis and Troubleshooting;
- Non-Traditional Machining Processes;
- Theory of Metal cutting and Optimization;
- Hydraulic and Pneumatic Control;
- Control and Mechatronics Applications in Thermal Plants;
- Process Control Instrumentation, fundamentals, operations and maintenance;
- Advanced Measurement and Control Systems;
- Operation, Control and Maintenance in Boilers;
- Vibration Analysis;
- Fundamentals of Design and Operation of Combustion Equipment;
- Energy Conversion and Energy Audits;
- Reading and Interpreting Machine Drawings for Technicians;
- Modern Techniques for Machining of Hard and Brittle Alloys;
- Preparation and Characterization of NANO-Particles;
- PLC;
- Industrial Applications of Artificial Intelligence;
- Robotics;
- Material Testing, Fatigue and Heat Treatment.

**PETROLEUM ENGINEERING**

- Introduction Workshops in:
  - Wellheads;
  - Separators and Tanks;
  - Plunger Lift;
  - Pumping Units;
  - Gas Lift;
  - Dehydration;
  - Automation;
  - Open Pit Mine planning and Design;
- Oil Recovery Processes in Conventional and Unconventional Reservoirs;
- Reservoir Characterization;
- Computer Applications in Reservoir Characterization;
- Gas Reservoir Engineering;
- PVT Fluid Property Characterization & Rock Mechanics;
- Water flooding from A to Z for Homogeneous and Heterogeneous Reservoirs;
- Feasibility Studies of Mining Projects;
- Practical Geo-statistics, Modeling and Spatial Analysis;
- Underground Mining methods and Equipment;
- Well logging principles and interpretation;
- Production Logging.
TESTING FACILITIES
The faculty of Engineering houses a state-of-the-art testing facility that covers five active areas of engineering, namely, Architecture, Chemical, Civil, Mechanical and Petroleum. The Faculty is equipped to support its industrial partners and the industrial community at large in providing a wide range of test according to domestic and international standards.
The engineering departments offer the following range of standard tests:

**ARCHITECTURAL ENGINEERING**

- Environmental noise impact assessment;
- Workplace noise assessment;
- Noise measurements;
- Equivalent levels sound measurements;
- Relative humidity;
- Moisture content;
- Ambient temperature;
- Indoor and outdoor comfort analysis;
- Wind speed;
- Measuring luminous flux per unit area;
- Internal lighting analysis;
- Fenestration design to adopt internal and natural lighting levels.
Sound level meters

Psychro-meter

Anemometers

Light meter

Thermocouple datalogger
**CHEMICAL ENGINEERING**

**Environmental and Water lab**
The Environment Laboratory has a wide range of equipment for assessing environmental aspects and performing the following tests:

- Chemical Oxygen demand (COD) of water;
- Biological oxygen demand (BOD) of water;
- Light intensity and Noise intensity;
- Analysis of Exhaust gases;
- Particulates intensity in air, Heat impulse, Temperature, Humidity;
- Jar Test for to determine optimum operation conditions for coagulation process;
- Kits for determination of Inorganic anions;
- Turbidity measurements;
- Preliminary Industrial waste water treatment processes.

**Petrochemicals lab**
This lab mainly has testing facilities for crude oil, its products and natural gas

- Gasoline ASTM;
- Crude Oil ASTM;
- Viscosity measurements over a wide range of temperatures and pressures;
- Aniline point;
- GC (for gas analysis);
- Water content in crude oil.

**Electrochemistry Lab**
Electrochemical characterization using

- Potentiometer;
- Cyclic voltammetry;
- Linear sweep voltammetry.

**Instrumentation Lab**

- Identification and quantification of components in a mixture using High Performance Liquid Chromatography (HPLC). It can be used for medical, biological and catalytic products;
- Identification of chemicals through their absorption spectrum using Fourier transform infrared spectroscopy (FTIR);
• Identification of chemicals through their absorption spectrum using UV-VIS spectrophotometers.

Noise measurement  
Turbidity meter

ASTM Distillation
Viscometer

Aniline Point
Gas Chromatography

Flash Point

Pour Point
Potentiometer

Cyclic Voltammetry/Linear Sweep Voltammetry
UV-VIS Spectrophotometers

High Performance Liquid Chromatography
Fourier Transform Infrared Spectroscopy
CIVIL ENGINEERING

- **Construction Materials Testing:**
  - Flakiness Sieves;
  - Los Angeles Test;
  - Concrete Compressive Test;
  - Concrete Slump Test;
  - Flow Table;
  - Consistency Container;
  - Rebound Hammer;
  - Bending Strength Tester;
  - Ultrasonic Testing.

- **Soil Mechanics Testing:**
  - Boreholes and SPT;
  - Sieve Analysis;
  - Atterburg Limits;
  - Hydrometer Test;
  - Unit Weight and Specific Gravity;
  - Sand Cone Test;
  - Free Swelling Test;
  - 1-D Consolidation;
  - Tri-axial Test;
  - Direct Shear Test;
  - Constant/Falling Head Premameter;
  - Chemical Tests;

- **Surveying & GPS works:**
  - Setout Traverse Points and Observation;
  - Graphical Communication and Mapping;
  - Plan and Geodetic Survey Calculations;
  - Measurement Analysis and Data Adjustments;
  - Survey Planning, Processes, and Procedures;
  - Possessing Satellite Images;
  - Distance production of Digital Maps.

- **Pavement Materials Testing:**
  - Aggregate Test;
  - Water Absorption and Specific Gravity Tests;
  - Crushing and Impact Tests;
- Los Anglos Test;
- Bitumen Tests;
- Penetration Test;
- Tests on Bituminous Mixes;
- CBR Tests.

Sieve Analysis

RC Cubes & Cylinders Compression Test
Schmidt Hammer

Los Angeles Machine
Slump Apparatus

Ultrasonic Test
VCAT Apparatus

Hydrometer
Sand Cone Test
Consolidation Test

Tri-axial Test

Direct Shear Box
Permeability Test

Level

Total Station
GNSS (GPS & GLONASS)
MECHANICAL ENGINEERING

- Strength of Material (tension, compression and three points bending);
- Material Hardness (Rockwell, Vickers and HB);
- Micro-Structure;
- Heat Treatment;
- Torsion Test;
- Solar Radiation Measurements;
- Wind Station Measurements.

Furnace

Hardness Machine

Optical Microscope
Universal Testing Machine

Torsion Machine
Impact Testing
PETROLEUM ENGINEERING

- Special Core Analysis Laboratory Tests;
- PVT Lab;
- Computed Tomography CT
  - Pore size distribution;
  - Grain size Distribution;
  - Grain Sorting.

- Surveying Lab
  - Surface and subsurface maps production;
  - Setting out of surface facilities from maps on site;
  - Bulk volume of the reservoir.

- Software labs
  - Reservoir characterization reports;
  - Hydrocarbon reserves estimation;
  - Prediction of the life of the reservoir;
  - Reservoir performance;
  - Field development plan (FDP).

Digital Gas Mermeameter
Bench Top Permeability System

Ambient Electrical Resistivity System
Gravimetric Capillary Pressure System

Amott Wettability Apparatus

Core Driller
Single Trim Saw

Single Face Grinder
PVT Phase Behaviour System
Rolling Ball Viscometer

Digital Gasometer
Equilibrium Flash Separator

Floating Piston Cylinder

Deadweight Testers and Gauges
Polarization Microscope

Mud Balance
API Filter Press

VG Meter

Electronic Thermometer
Emulsion Stability Tester
COMMUNITY ENGAGEMENT SCHEMES

In order to successfully achieve the BUE's mission and vision regarding its role and responsibility towards the community, several engagement schemes were developed to establish a platform for communication and exchange of ideas with the industry and the community at large. The first is the engagement of industry representatives in a liaison committee that could benefit from the industries’ views and requirements in updating the current programmes. Another mode is a regular linkage seminar that could establish the needed structured platform for discussions. The establishment of industrial partners for the BUE is another form of engaging the industry and providing services for a select group of partners, which could ensure mutual benefit for both parties. Finally, the student internship programme allows the inviting companies the opportunity to train students who are the future employees to their standards and systems so they are ready to function from day one.
INDUSTRIAL-FACULTY LIAISON COMMITTEE

The Faculty of Engineering at BUE has established an Industrial-Faculty Liaison Committee in order to engage the industry with the educational process at several levels. The industry is invited to participate in this committee in order to review current programmes and propose updates and new programmes to suit the market needs. In addition, the discussions, at this committee, also explore potential collaboration projects and opportunities for student internships. The committee is assigned the following responsibilities:

1. To promote and develop mutual collaboration schemes that engage relevant industrial partners with the academic community within the Faculty;

2. To explore and identify potential internship opportunities;

3. To solicit industrial advisors’ recommendations regarding current Engineering programmes;

4. To consult with industrial advisors’ regarding the establishment of new programmes;

5. To establish a platform for engaging the Faculty's research community in analyzing and solving industrial relevant problems;

6. To identify potential areas of expertise in order to develop and propose training workshops for industrial partners.

INDUSTRIAL LINKAGE SEMINAR SERIES

The Faculty of Engineering at BUE is emphasizing its role towards the community through extending its expertise, facilities and capabilities to interact with the industry and engage in a dialogue that would provide collaboration schemes and help foster innovative solutions to persisting industrial challenges. One of these dialogue platforms is a series of one-day seminars that aim at engaging industry professionals with academics in an attempt to map industrial research and/or problem solving needs to the Faculty of Engineering capabilities and expertise.

The seminar is structured in three parallel sessions to map the three main themes within the faculty. Within each of these sessions two main types of contributions are identified. The first, reflects the current BUE capabilities, expertise and facilities, while the second, reflects the introduction of industrial needs and expectations. This will identify sets of shared topics in each of the three themes and thus would be manifested in further in-depth
more directed seminars and ultimately a group of collaborative research/consultation projects.

The three main theme areas are defined as follows:

- Housing, Construction & Urban Development (ARCH/CIVL)
- Electro-Mechanical Applications (ELEC/MECH)
- Petro-Chemicals, Energy & Gas Technology (CHEM/PTRL)

INDUSTRIAL PARTNERSHIPS

The Faculty of Engineering at BUE is embarking on a new stage of its development, whereby, it is now of the utmost importance to extend its resources, facilities and expertise to support the industry and the community at large. By identifying a select group of industrial partners, mutual interests are expected to be achieved through the creation of a partnership that supports the interests of both sides. A model scheme for establishing partnerships with industrial firms is developed and outlines a framework for such a partnership with specific benefits to and responsibilities on both sides.

The proposed partnership scheme comprises several categories of partnerships whereby each category would allow a set of benefits for the industrial partner in return for an annual sponsorship fee that is used by the Faculty in supporting its activities and maintaining and upgrading its lab facilities. The following are the potential services that could be offered by the Faculty of Engineering at BUE:

a. Training Workshops;
b. Lab tests with validated results and official reports;
c. Professional Consultations;
d. Research & Development Services;
e. Specific Research Problems;

In addition, all partners will be featured in the Faculty's professional magazine "Research Focus". The distribution of this magazine is expected to cover a wide range of academic institutions in the region in addition to a wide range of multi-national industrial firms.

All partners are also expected to support the Faculty's students and graduates in the following forms:
a. Providing potential training opportunities;
b. Providing potential topics for graduation projects;
c. Providing tools, equipment and material for graduation projects;
d. Sponsorship of top students in their graduation projects;
e. Providing potential job opportunities.

In addition to accessing the BUE’s facilities and expertise to foster innovative solutions to persisting industrial challenges, all partners will have the chance to help shape our graduates who are the workforce of tomorrow, thus ensuring the knowledge, quality and training of its future workforce. Such future graduates shall be ready to function according to the partners’ relevant standards and operational systems from day one.

STUDENT INTERNSHIP PROGRAMME
The Faculty of Engineering at BUE requires all engineering students to engage in an industrial internship programme twice during their five years of study. Such internships are graduation requirements and students are required to submit a report and a presentation at the end of each internship session in order to pass. The faculty has established an internship office whereby industrial partners who are interested to offer our students internship opportunities are identified. Internship profiles were developed for all programmes within the faculty and represent the current state of knowledge of students at each stage and the expected level of training they should acquire.

Engagement in the internship programme allows all our industrial partners the opportunity to identify future employees while conducting their training as part of their undergraduate education in order to be ready for the job from day one. Such graduates would be familiar with the relevant companies procedures and systems and would be ready for integrating within the system as soon as they graduate.