Madan Bhandari University of Science and Technology

Forest Biomaterials Science and Engineering Programs

An Introduction

The University offers PhD and Master of Applied Science Programs in Forest Biomaterials Science and Engineering (FBMSE). FBMSE is a new program offered by a limited number of universities in the world. This program is designed to respond to the national need for the sustainable utilization of the rich and vast forest resources and global need for sourcing raw materials needed for industry and daily life from renewable sources.

Three major themes under this program are timber products, biomass conversion and non-timber forest products (NTFP).

In spite of the vast timber resources, Nepal imported wood products valued at US$40.2[1] million in 2023. The primary reasons for this import are low quality of timber products derived from the hard wood, lack of suitable technology for use of the soft wood and inability to develop new timber products. The program aims at addressing the above problems by conducting research in the following areas among others: forest management for production of quality timber, development of suitable technology for seasoning of various varieties of timber – soft and hard; development of technology specifically aimed at utilization of soft-wood, plant extract-based treatment of bamboo and timber; mechanical characterization of indigenous timber and bamboo species; development of new timber and bamboo products including laminated timber and bamboo; upgrading of existing bamboo and timber products; and identification of geographical location for plantation of various species of trees for timber production.

The scope of non-timber forest products, which includes primarily medicinal and aromatic plants (MAP), is limited. Though there is a long tradition of the use of MAP, the studies related to identification of potential uses of MAP is limited. Because of this MAP is exported mostly in the raw form missing the opportunity for wealth generation for the country through value addition. This program will focus on research, development and innovation the following areas: characterization of all MAP in terms of the identification of bioactive compounds in them; phyto-chemical analysis of essential oils used in ayurvedic aromatherapy and microencapsulation; identification of potential areas of use of bioactive compounds for nutraceutical, immunomodulatory and medicinal purposes; development of products such as nutraceuticals, immunomodulators, natural food colorants and preservatives, processed MAP and cosmetics; making products like tea and coffee more rich in flavors.

The efforts in the direction of biomass conversion is limited. Biomass can be converted to biofuels and other valuable green chemicals. Some of the potential research areas for students related to biomass conversion are production of high-performance bio-adhesives based on rosins; development of high-quality plant-based fibers; sustainable wool-alternative from *Miscanthus nepalensis*; derivation of plant-based nano-particles for heavy metal removal from wastes; and densifications and torrefaction of waste biomass for fuel production.

Because of the name of the program/degree people may perceive this program as a type of traditional forest science degree, which is not the case. The primary purpose of this program is the utilization of forest resources in a sustainable manner that is by conserving the forest. This degree is essentially a Materials Science and Engineering degree. The word "forest" is added in front of the name because the scope of the program is limited to forest biomaterials. This program is being offered, first, in response the world-wide trend to move away from non-renewable resources to renewable and sustainable resources and, second, to tap the vast forest resources for the benefit of Nepalese.

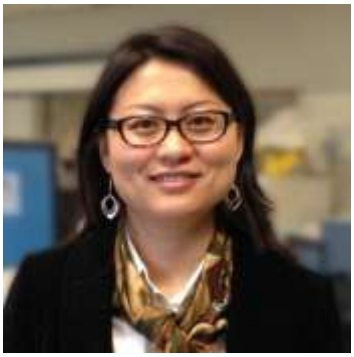
The primary aim of this degree is to develop technology for sustainable harvesting and processing of forest biomaterials including wastes by equipping its graduates with science and engineering knowledge and skills.

This degree is a research-based degree. While graduates of a course-based degree are trained to use available of-the-shelve knowledge and technology to solve technological problems, graduates of a research-based degree are trained to solve technological problems, which cannot be solved using available of-the-shelve knowledge and technology, using their research skills. Therefore, graduates of this program should be able to develop new technology for developing sustainable products from forest biomaterials. Such products, among others, include construction materials, food and food supplements, medicines, fibers, green chemicals, MAP, fertilizers, pesticides etc.

For those who wish to pursue PhD this is an ideal degree because graduates of this program will acquire research skills needed for PhD.

Because of the multi-disciplinary nature of this program with heavy science and engineering content graduates of wide-ranging profiles like mechanical, chemical and structural engineering, biotechnology, microbiology, chemistry, agriculture, pharmacy forestry etc. are well suited for this program.

International Resource Persons



Prof. Ning Yan

PhD, Chemical Engineering and Applied Chemistry; Honorary Chair, Forest Biomaterials Science and Engineering, MBUST; Teir 1 Canada Research Chair in Sustainable Bioproducts; Distinguished Professor in Forest Biomaterials Engineering; Director, Low Carbon, Renewable Materials Center, University of Toronto, Canada

Prof. Hom Nath Dhakal

PhD Mechanical Engineering; Honorary Chair, Sustainable Biomaterials, MBUST; Head, Advanced Materials and Manufacturing Research Group, University of Portsmouth, UK

Prof. Bishnu Acharya

PhD Mechanical Engineering; Chair, Bioprocess Engineering & Associate Professor Chemical and Biological Engineering University of Saskatchewan, Canada

Equipment Facilities

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IR spectrophotometer

Rotary vacuum evaporator

UV spectrophotometer

Polarimeter

Freeze dryer

Shimadzu GC-MS-MS

Increment borer

Epson Expression 13000XL Archival Scanner

Equipment Facilities Cont'd…

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Microtome
under procurement

Compound trinocular microscope

Atmospheric muffle furnace

Heating mantle

Hot plate with stirrer

Shimadzu UTM (300 KN)

Vacuum oven

Overhead stirrer

Hydro distillation unit

Laboratory and Academic Engagement

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Invited Lectures from around the world


Dr. Krishna Gopal Dongol
MANE SEA, Singapore


Dr. Lok Ranjan Bhatta
NAST


Prof. Dr. Bishnu Pd. Acharya
Saskatchewan University


Dr. Arturo Pacheco Solana
University of Padova

Community Engagement

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