

Master of Science (Building Performance and Sustainability)

SYLLABUS (IMPLEMENTED IN AUGUST 2016)

Description of Modules

ESSENTIAL MODULES

BPS5111 Integrated Building Design

This module aims to provide the concept, principles, methods and practice of integrated building design that adopts total building performance (TBP) as the underlying paradigm. Integration is emphasized, fostering holistic considerations for performance from the structure, facade, mechanical & electrical and interior systems, and consistently devolving this through design development, contracting, construction, commissioning and into the occupancy phases.

BPS5112 Green Building Integration and Evaluation Studio

This is a studio-based module that synthesizes the theoretical and practical aspects of building performance and detailed design development, bringing sustainable design concepts and elements to the forefront. The needs for sustainable design and its integration into a holistic performing building will be a key principle of studio learning. Design decision support using simulation tools will be brought to life in studio environment in the realization of holistic sustainable building. Simulation tools will be used for thermal, ventilation, IAQ, lighting and acoustics. Current sustainable building assessment techniques will be applied. Studio will be jointly conducted by academics and leading industry practitioners, particular focus will be given to sustainable building design covering both new build and retrofit of existing building.

PRESCRIBED ELECTIVE MODULES

BPS5221 Microclimate Design

This course deals with the principles of microclimatic design both at the building and urban level. It emphasizes on the elements of microclimates and their effects on building design and the planning of urban settlements and vice-versa. The issues of Urban Heat Island and the possible mitigation measures and their application towards achieving comfort and efficiency with special reference to the humid tropics are emphasized.

BPS5222 Indoor Environmental Quality

This module deals with the four key performance mandates that are responsible for ensuring good IEQ. The thermal performance deals with thermal comfort in all types of buildings and climates including adaptive comfort models. The indoor air quality (IAQ) performance examines the relationship between IAQ and occupants' well-being and health and identifies the types and sources of indoor air pollutants and means of minimizing the problems. The experimental procedures of investigating and analysing thermal and IAQ issues are also introduced. The lighting performance deals with visual perception, color classifications and lighting installation design with specific reference to integration and control of artificial and day lighting, choice of light sources and lighting systems. The acoustic performance deals with community noise rating systems and the propagation of sound in the urban environment. Environmental noise monitoring and modelling, sound transmission and

acoustical design of rooms will be discussed. Laboratory and field measurements using acoustical instruments will be used to strengthen students' understanding and analytical and presentation skills on the subject.

BPS5223 Building Energy Performance - Passive Systems

This module deals with Energy Efficient (EE) Technologies, i.e. passive systems for Green Buildings. The focus is on building facade optimization and the EE domain includes thermal, daylight, ventilation performance and the choice of suitable materials as well as the interrelation of these with architectural design (e.g. form, shape, orientation, massing). Analysis and optimization capability teaching is established on a basic understanding of heat transfer mechanisms in buildings. It also deals with the introduction of prevailing analysis, evaluation and optimization methodologies.

BPS5224 Building Energy Performance - Active Systems

This course deals with active design of building systems for good IEQ and energy performance. It includes the conventional heating, ventilating and air conditioning (HVAC) systems typical of most existing buildings as well as emerging technologies such as district cooling/heating systems, cogeneration/tri-generation systems and energy-efficient air-conditioning and air distribution systems. The Renewable Energy domain includes photo-voltaics, solar-thermal, geothermal, wind and fuel cells.

BPS5225 Building Energy Audit and Performance Measurement and Verification

This module considers the objectives and methodologies in conducting a detailed building energy audit. The module commences with the evaluation of energy performance indicators and their influence on measurement methodology, and the designing of auditing strategy. The statistical interpretation of results, measurement accuracy and instrumentation strategies are also major topics of the module. Once the energy saving opportunities are identified, work shall commence on the evaluation and recommendation of energy conservation measures, and their ranking through the rates of return on investment (ROI). Different modes of procurement in energy retrofit projects and the fundamental principles of Energy Performance Contracting will be examined. Finally, upon the completion of an energy retrofit programme, the requirements and critical conditions for an accurate performance measurement and verification would also be discussed.

BPS5226 Smart Buildings and Facilities

This module aims to provide the concept and principles of smart buildings and facilities. It discusses the concept of how building performance can be optimized using software and hardware. Students are exposed to building control systems, software, analytics and several case studies are discussed.

BPS5227 Maintainability and Green Facilities Management

This module focuses on the evaluation of design and spearheading the integration of sustainable design and maintainability, with green facilities management (FM) in mind throughout the life cycle of a facility, right from the planning/design stage. It aims to improve the standard and quality of design, construction and maintenance practices to produce efficient facilities that require minimum maintenance. Major topics covered include technical issues related to maintainability and green FM of major components of a facility for wet area, façade, basement,

roof and Mechanical & Electrical services. Other topics covered are the implications and selection of materials for high maintainability, diagnostic techniques and maintainability grading system.

BPS5228 Advanced Building Materials and Structures

This module aims to develop a strong knowledge base on the different building materials and technique of designing structural frames with some of these materials. As a whole, this module focuses on key building materials that are applied to the envelope and structural systems of buildings. For the envelope system, coatings made from advanced nanotechnology and phase change materials will be taught. Conventional yet important structural materials such as wood, steel, wood and masonry will be covered next, leading to the discussion on various types of structural systems and their designs. Finally, life cycle assessment will be introduced as a basis for evaluating and selecting environmentally superior materials.

BPS5300 Special Topics in Building Performance and Sustainability

This module provides the opportunity for timely introduction of novel and state-of-the-art ideas and developments in the domain of building performance and sustainability. It is typically designed to allow students to conduct independent studies on special topics in Building Performance and Sustainability under the guidance of a staff member. Students are normally required to submit a 6,000-word report, and the module may include other modes of assessment. This module enables students to develop a deeper understanding in a particular area of the broad domain that may not necessarily be an integral part of the curriculum in the modules offered. Typically, there will be no examination and this module is entirely 100 CA.

BPS5000 Dissertation

This module is designed to allow students to investigate a topic of their own choice and relevance to the programme and submit a 12,000-word written dissertation. The independent research, under the guidance of a supervisor, is to be conducted over a period of two semesters. This module enables students to develop a deeper understanding in a particular area of the broad domain that may not necessarily be an integral part of the curriculum in the modules offered. The dissertation will be submitted and graded by two examiners.