

List of Modules

Core Modules:

All the modules are 4MCs each.

SDM 5001 Systems architecture (new module)

Systems Architecture deals with principles of implementation and evaluation of complex systems. Developing architecture is the most abstract function in system/product development. The course examines various notions of systems architecting (including aspects of organizational and information architecture) and offers principles and tools for its development. A wide variety of real-world case studies (including examples of transportation, utility, electronic, mechanical, enterprise, traditional information and document management systems, etc.) will be drawn upon. The course addresses issues such as dealing with legacy and change, enterprise-wide interoperability as well as support for knowledge management. The course may be viewed as an opportunity to integrate knowledge from diverse areas to address high-level architectural design issues within realistic systems contexts.

SDM 5002 Systems engineering (new module)

Systems Engineering is an interdisciplinary approach to realize the successful creation of systems that meet customer and stakeholders requirements with due consideration of the system's performance and impact over the entire life-cycle. The module covers the fundamental methods and concepts of this approach including those to surface system requirements; architect options and alternatives; model systems; evaluate performance; and analyze tradeoffs.

SDM 5003 Knowledge management (new module)

As the knowledge economy and globalisation intensifies, the field of knowledge management is becoming crucial to corporate competitiveness. Knowledge Management (KM) is a relatively new subject area which is in this course conceptualized as a strategy for improving organizational performance through a set of processes, tools and incentives designed to help people create, share, and integrate knowledge. The main idea is that knowledge can be purposefully managed in order to improve knowledge transfer, its re-use, adaptation to rapidly changing environments, and the creation of innovative new products and services. Module covers: (i) basic concepts of the nature of knowledge and its creation; (ii) organizational culture and learning organizations (iii) explicit and tacit knowledge as well as knowledge artefacts; (iv) technology and its role in knowledge creation, sharing, and management; (v) the information professional and ethical considerations.

IE5208 Systems Approach to Project Management

This module presents ideas of systems analysis and project management in a manner which demonstrates their essential unity. It uses the systems development cycle as a framework to discuss management of engineering and business projects from conception to termination. The module is divided into three interrelated parts: systems analysis and project management, project selection and organizational behavior, and systems and procedures in project planning and control.

Electives

The elective modules are organized into two separate lists; all are 4 MCs each except for SDM5900: SDM Project which is 8 MCs.

1. Systems methodology and management

BMA5004 Management & organization

This course will explore sociological and psychological perspectives on management. It will also introduce students to basic aspects of planning and strategic decision-making. Students will examine organisational structure and processes. Topics explored will include organisation structure and design; organisation culture; the nature and functioning of small groups in organisations; and organisation development and change. In the area of planning, special attention will be paid to the planning process and the importance of strategic planning in the formulation and attainment of organisational goals. Students will also explore the implications of individual differences for effective management of organisations. The particular aspects of individual differences explored may include perception; motivation; attitudes and attitude change; leadership; the exercise of power and influence in organisations; and the role of values in the discharge of the social responsibilities of management.

BMA5251/ TR5201 Management of technological innovation

The module introduces the foundations of managing technological innovation. The readings and discussion will focus on the concepts and frameworks for analyzing how firms can create, commercialize and capture value from technology-based products and services. The topics covered include (1) technological change and how it affects competition between new and existing firms, (2) strategies for firms competing in high-technology industries, (3) how to create and manage an innovative organization, and (4) entrepreneurship and venture capital.

IE5003 Cost Analysis and Engineering Economy

Cost and engineering economic analysis with special emphasis on a unified approach based upon cost accounting, operations research, economics and other quantitative methods. Topics include cost accounting and cost analysis, cost estimation, methods of engineering economic analysis, analyses for government projects and public utilities, effects of income taxes in economy studies, depreciation methods, risk and uncertainty in engineering economy studies, replacement studies and models, capital budgeting and computer applications.

IE5202 Applied forecasting methods

Major techniques of statistical time series analysis and forecasting. Topics include principles of model building, advanced regression analysis, smoothing and moving average models, Box-Jenkins methodology and the use of statistical packages.

IE5203 Decision Analysis

This module teaches the necessary analytical knowledge and practical skills for improving decision-making processes in engineering and business environments. This is achieved by providing a paradigm based on normative decision theory and a set of prescriptive tools and computational techniques using state-of-the art software with which a stake holder can systematically analyze a complex and uncertain decision situation leading to clarity of action. Topics from utility theory and influence diagrams modeling to multi-attribute utility theory and analytic hierarchy process are covered.

IE5404 Large Scale Systems Engineering

IE 5404 deals with the complexities of large scale systems. The Systems Approach and Systems Engineering methodologies are used by the students to understand the key issues in the planning, design and management of large scale systems. The class will be divided into four teams. Each team will study three case studies of large scale systems and present their findings to the class. Modern management thinking on the Learning

Organization will be learnt by the students through reading the book Fifth Discipline. Students are expected to learn to work in a team and to learn about team learning through practice. They will have ample opportunities to interact with each member of their team when they practise what they had learnt from the textbooks in the case studies. Each Team will use Systems Dynamics, Analytic Hierarchy Process and the software Expert Choice to study a complex system as their term project.

IE5409 Topics in Systems Engineering

This is an advanced module in Systems Engineering. Specific topics are selected on the basis of current teaching and research needs. Lectures will be given by both department staff and visiting specialists.

PP5240 Selected topics in applied policy analysis

The course provides the students with the knowledge and skills to understand and effectively manage different aspects of the policy process: recognizing problems; developing alternatives to address the problems; devising criteria for choosing the alternatives; gaining support and acceptance from stakeholders; crafting implementation strategies; evaluating the implementation; and dealing with unexpected consequences. The class discussions are contexts in realistic scenarios and current events. They present problem-solving skills in one or more specific policy areas, such as health care, environment, transportation, science and technology, housing, social policy, etc. Specific contents of the course vary from year to year depending on the interests of faculty and students, and current events.

2. Systems application

TP5026 Transportation management & policy

This module is designed to provide senior level undergraduate and graduate students with an overall view of the transportation systems, means of managing and influencing the systems to achieve certain goals. The topics covered include the characteristics of land, sea and air transportation systems; roles and structure of government agencies in transportation management; environmental and social impact of transportation systems, travel demand management; public transport management; models of financing transportation services; regulation and deregulation of transportation services; roles of intelligent transportation systems in system management and policy implementation; case studies of transportation policies in several countries

TP5028 Intermodal transportation operations

The module will critically examine the dimensions of an integrated inter-modal transport system in relation to the changing logistics and supply chain practices of procurement, production and distribution. Themes and issues studied include the analysis of inter-modal choices using the total cost concepts in distribution, the international-domestic interface, advanced technologies in inter-modalism, the role of government in inter-modal integration. The module will also introduce simulation analysis for multi-modal operations, including building, calibration and validating models, output analysis and application programming interface.

CE5804 Global infrastructure project management

Prerequisite: CE2183 or CE4 standing or higher

In today's construction, there is increasing competition from global players with international participation. Due to this competition, a company, for its own survival, will need to venture into construction markets overseas. This course has been repositioned with a new title and content to give in-depth coverage of issues that affect engineering constructors involved in large-scale infrastructure projects in international construction markets. The course goes beyond the basics covered in the first undergraduate course and emphasises the global characteristics of large-scale civil infrastructure projects.

Specific topics include international construction markets and project financing, risk management, value management, competitive bidding, integrated construction logistics, computer-integrated scheduling and resource allocation, construction modeling and simulation. Students benefit from the experience of speakers from large international engineering constructor companies involved in the development of such infrastructure projects. This course equips students to successfully manage complex infrastructure projects in international construction markets. They will learn to manage complex construction logistics and value chain from design to construction. The course will also deal with the problems of financing and managing the risk of such large-scale projects. Students will also learn advanced computerised techniques for project planning, modeling and simulation.

ME5602 Manufacturing systems engineering

This module deals mainly with decision-making procedures for manufacturing systems, production management, and factory automation. Topics covered include production planning and scheduling, inventory control, concepts of computer-integrated manufacturing, and modelling and analysis of advanced manufacturing systems. Students are expected to carry out an independent study through project work or term paper on one of the related topics.

ME5205 Energy engineering

The objective of this course is to approach the study of energy conversion systems from an overall thermo-economic perspective. Students will gain the ability to integrate the various energy related topics covered in the undergraduate programme to evaluate the performance and make economic decisions on energy systems. The module will cover the following topics: energy perspectives, energy sources, thermodynamic aspects of energy conversion systems, performance evaluation of energy systems, improvement of energy efficiency, energy management, environmental aspects of energy use, thermo-economics, future trends in energy conversion, introduction to energy policy issues.

IE5401 Industrial logistics

Prerequisite: IE5001 or IE2110

This module provides a sound basis for understanding the fundamental nature and functional areas of logistic systems, and the activities concerned with the efficient management of industrial logistics. Topics covered are fundamentals of industrial logistics, components of logistic systems, logistics policy, transport network systems, vehicle routing and scheduling, fleet size determination and crew scheduling.

IE5211 New Product Management

This module introduces students to new, emerging concepts in the management of new product development. The entire new product development process, from the initial idea generation and screening phase to the final commercialization and monitoring phase, is examined. Project selection models, project organization, interdepartmental interface, technical and marketing issues are included in the topics discussed. Materials will be drawn from real-life industrial practices and state-of-the-art research findings. Lectures, case study readings and discussions will be used.

CN5191 Project engineering

The objective of this module is to provide an in-depth description of Project Engineering as practiced by the primary CPI contractors. An overview of the chemical process industry (CPI) construction activity world-wide and regionally is provided. In order to achieve an understanding of Project Engineering as practiced by the primary CPI contractors, the organization of chemical plant capital projects, the roles and functions of personnel, logistics and scheduling etc are discussed in detail. Further, a practical introduction to state-of-the-art chemical plant design software is also provided. This is a

postgraduate module targeted at students with a potential career interest in the CPI construction area.

EE5702 Advanced power systems analysis

Power System and Analysis module forms as the foundation module for all students who want to specialize in Electric Energy System Engineering and provides the necessary background in power system area. Various topics covered include: short-circuit studies; load-flow studies; contingency analysis; economic dispatch; optimal power flow studies and state estimation. This module is a must for graduate level students to pursue other advanced level courses such as Power Systems Engineering, Power System Stability, Power System Protection, Artificial Intelligence Applications to Power Systems.

ESE5102 Sludge & solid waste management

This course introduces the advanced concept of sludge and solid waste management. It covers collection, quantification, characterization, processing, treatment, disposal and resource recovery in relation to sludge and solid waste. It will equip students with in-depth knowledge on principles of design, construction, operation and maintenance of various treatment and disposal facilities along with engineering, institutional, legal and financial infrastructures.

TD5101 Specification of complex hardware / software systems

The aim of this course is to provide skills for system level design of complex hardware/software systems. The trend that products and systems become communicating systems, with many parallel activities on multiple embedded processors, and with complex multimedia interfaces makes their design unmanageable with the current hardware/software co-design practice. This workshop presents a system level design approach that yields executable system level models based on object-oriented analysis and specification. A design process starts with a multidisciplinary discussion enabled by formal models that visualize collaborating processes of a system and its environment. These models show functional real-time behavior as well as system architecture. Subsequently, a model is extended with the properties of candidate implementation technologies. This enables verification and validation of required system properties. Dedicated models can be used for architecture studies on performance, channel bandwidths and real-time properties.

SDM5990 SDM Research Project (8 MCs, New Module)

This module involves independent research work by students on a relevant topic in Engineering Systems. The student will be supervised and continuously assessed by an academic faculty member. The student will submit a final project report which is a key component of the continuous assessment. The research project can normally be completed within 2 semesters but the period can be extended for 1 additional semester with a penalty of 0.5 grade-points (lower by 1 level in the achieved grade).