PhD Graduate Program
Core and Elective Modules

Last Updated 11 July 2017

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Course offered from : NUS Business School / Decision Science

Module Code: BDC6111 - FOUNDATIONS OF OPTIMIZATION (Module Credit: 4)

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Melvyn Sim (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Friday), 0900-1200 , Room: BIZ2-0420 (Lecture)

Learning Outcomes

This course will cover important topics in optimization theory including linear, network, discrete, convex, conic, stochastic and robust. It will focus on methodology, modeling techniques and mathematical insights. This is a core module for PhD students in the Decision Science department.

Preclusions: IE6001

Offered in semester 1 in AY2017/2018

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :4

no. of hours for preparatory work by a student per week :3

Course offered from : NUS Business School / Decision Science

Module Code: BDC6112 - STOCHASTIC PROCESSES I (Module Credit: 4)

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Wednesday), 0900-1200, Room: BIZ2-0420

Learning Outcomes

Probability space and random variables Outcomes, events, and sample space; probability measure and integration; distributions and expectation. Conditional expectation Conditioning on events; conditioning on random variables; general properties of condition expectation; introduction to martingales. Exponential distribution and Poisson process Memorylessness; counting processes; construction of Poisson process; thinning and superposition of Poisson processes; nonhomogeneous and compound Poisson process. Discrete-time Markov chains Markov property; stopping times and strong Markov property; classification of states; hitting and absorption probabilities; stationary and limit distributions.

Preclusions:IE6004

Offered in semester 1 in AY2017/2018

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :3

no. of hours for preparatory work by a student per week :4

Analytics Core Modules

Choose only 1

Module Code : BDC6307 - INTRODUCTION TO DATA ANALYTICS (Module Credit: 4)

Course offered from : NUS Business School / Decision Science

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Wang Tong (Click to view profile)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Thursday),1400-1700 Room: (Biz2-0420)

Learning Outcomes

This course aims to provide operation researchers a holistic introduction of classic statistics theories and modern statistical learning toolbox. It also lays the necessary foundations for more advanced machine learning courses.

Prerequisites: Calculus, Linear Algebra, Basic Probability Theory

Offered in AY2017/2018 (Semester 1) (Subject to changes, Please refer to IVLE for latest updates)

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :5

no. of hours for preparatory work by a student per week :2

Module Code : CS5339 - Theory and Algorithms for Machine Learning (Module Credit: 4)

Course offered from : School of Computing / Computer Science

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Lee Wee Sun (Click to view their profile)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Thursday), 1830-2130, Room: LT15

Learning Outcomes

The module aims to provide a broad theoretical understanding of machine learning and how the theory guides the development of algorithms and applications. Topics covered include the approximation capabilities of common function classes used for machine learning, such as decision trees, neural networks, and support vector machines, the sample complexity of learning different function classes and methods of reducing the estimation error such as regularization and model selection, and computational methods used for learning such as convex optimization, greedy methods, and stochastic gradient descent.

Prerequisites: CS3244. Knowledge of linear algebra, calculus, statistics, and algorithms will be assumed.

Offered in semester 2 in AY2017/2018

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :4

no. of hours for preparatory work by a student per week :3

Electives Modules
(OR Methods)

Module Code: BDC6304 - Robust Modelling And Optimization (Module Credit: 4)

Course offered from : NUS Business School / Decision Science

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (TBC), Room: (TBC)

Learning Outcomes

Discrete optimization is the study of problems where the goal is to find an optimal arrangement from among a finite set of possible arrangements. Discrete problems are also called combinatorial optimization problems. Many applications in business, industry, and computer science lead to such problems, and we will touch on the theory behind these applications. The course takes a modern view of discrete optimization and covers the main areas of application and the main optimization algorithms. It covers the following topics (tentative) integer and combinatorial optimization: introduction and basic definitions alternative formulations optimality, relaxation and bounds Graph Theory and Network Flow integral polyhedral, including matching problems, matroid and the Matroid Greedy algorithm polyhedral approaches: theory of valid inequalities, cutting-plane algorithms The course also discusses how these approaches can be used to tackle problems arising in modern service system, including static and dynamic matching markets, ad words allocation, pricing and assortment optimization etc.

Prerequisites: Theory of linear programming, including duality theory. Basic knowledge of algorithms and complexity.

Offered in AY2017/2018 (TBC) (Subject to changes, Please refer to IVLE for latest updates)

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :3

no. of hours for preparatory work by a student per week :4

Module Code: BDC6302 - DISCRETE OPTIMIZATION AND ALGORITHMS (Module Credit: 4)

Course offered from : NUS Business School / Decision Science

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (TBC), Room: (TBC)

Learning Outcomes

Discrete optimization is the study of problems where the goal is to find an optimal arrangement from among a finite set of possible arrangements. Discrete problems are also called combinatorial optimization problems. Many applications in business, industry, and computer science lead to such problems, and we will touch on the theory behind these applications. The course takes a modern view of discrete optimization and covers the main areas of application and the main optimization algorithms.

It covers the following topics (tentative): integer and combinatorial optimization: introduction and basic definitions,alternative formulations, optimality, relaxation and bounds, Graph Theory and Network Flow, integral polyhedral, including matching problems, matroid and the Matroid Greedy algorithm, polyhedral approaches: theory of valid inequalities, cutting-plane algorithms

The course also discusses how these approaches can be used to tackle problems arising in modern service system, including static and dynamic matching markets, ad words allocation, pricing and assortment optimization etc.

Offered in AY2017/2018 (TBC) (Subject to changes, Please refer to IVLE for latest updates)

Prerequisites: BDC6111/IE6001 Foundations of Optimization

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :3

no. of hours for preparatory work by a student per week :4

Module Code: BDC6301 - BAYESIAN MODELING AND DECISION-MAKING (Module Credit: 4)

Course offered from : NUS Business School / Decision Science

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (TBC), Room: (TBC)

Learning Outcomes

This module examines current issues and trends in information systems and e-Business. Topics covered include strategic use of information technology (IT), information systems planning, knowledge management, impact of IT and e-Business, systems development and evaluation of information systems. Students will be required to critically analyze the theories and supporting research relating to these various issues. The issues will also be linked to various research areas that students can examine for their thesis.

Offered in AY2017/2018 (TBC) (Subject to changes, Please refer to IVLE for latest updates)

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :3

no. of hours for preparatory work by a student per week :4

Module Code: BDC6305 - THEORY AND ALGORITHMS FOR DYNAMIC PROGRAMMING (Module Credit: 4)

Course offered from : NUS Business School / Decision Science

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (TBC), Room: (TBC)

Learning Outcomes

This module covers the fundamental models, theory, and algorithms for dynamic programming with an emphasis on Markov decision processes (MDPs). We give particular attention to overcoming the curse of dimensionality and focus on modern techniques for solving large-scale dynamic programs.

Offered in AY2017/2018 (TBC) (Subject to changes, Please refer to IVLE for latest updates)

Prerequisites: Suitable mathematical maturity

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :5

no. of hours for preparatory work by a student per week :2

Module Code: BDC6306 - STOCHASTIC PROCESSES II (Module Credit: 4)

Course offered from : NUS Business School / Decision Science

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (TBC), Room: (TBC)

Learning Outcomes

This module aims to provide the first-year PhD students with a rigorous introduction to the fundamentals of stochastic processes. Topics include (i) Continuous-time Markov chains, (ii) Renewal processes, (iii) Brownian motions, and (iv) Stochastic orders

Offered in AY2017/2018 (TBC) (Subject to changes, Please refer to IVLE for latest updates)

Prerequisites: IE6505 Stochastic Processes II

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :5

no. of hours for preparatory work by a student per week :2

Module Code: BDC6303 - QUEUES AND STOCHASTIC NETWORKS (Module Credit: 4)

Course offered from : NUS Business School / Decision Science

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (TBC), Room: (TBC)

Learning Outcomes

This module introduces the theoretic foundations, models, and analytical techniques of queueing theory. Topics include continuous-time Markov chains, Littles law and PASTA property, Markovian queues and Jackson networks, fluid models, heavy-traffic analysis, and diffusion approximations.

Offered in AY2017/2018 (TBC) (Subject to changes, Please refer to IVLE for latest updates)

Prerequisite: IE6505/ BDC6306 Stochastic Processes II
Preclusions: Queues and Stochastic Networks

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :5

no. of hours for preparatory work by a student per week :2

Module Code: IE6511 - Surrogate and Metaheuristic Global Optimization (Module Credit: 4)

Course offered from : School of Engineering / Industrial Systems Engineering & Management

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) Lecturer

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Wednesday), 1400-1700, Room: E1-06-01

Learning Outcomes

This module describes sophisticated surrogate global optimization algorithms (for continuous and/or integer variables) for computationally expensive functions (including objective functions that are computed from a multimodal complex computer code.) with optional parallel algorithms. Metaheuristic search methods including simulated annealing, tabu search, genetic algorithms, dynamically dimensioned search, and particle swarm. Both single objective and multi-objective methods are discussed. A theory section covers convergence of surrogate global optimization, simulated annealing, genetic algorithms, and the proof of the No Free Lunch Theorem. Statistical analysis for comparing algorithm performance is presented. Students will utilize existing software packages in Matlab or Python for surrogate optimization and for some metaheuristics. Offered in both semester 1 and 2 in AY2017/2018

Prerequisite: Student should be in a PhD program in Engineering or Physical Science or Decision Science (in Business School) or in PhD program of Operations Research Analytics Cluster.

Preclusions: IE6499A Adv Topics in SE: Metaheuristic & Surrogate Optimization

Offered in semester 2 in AY2017/2018

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :5

no. of hours for preparatory work by a student per week :2

Module Code: MA5268 - Theory and Algorithms For Nonlinear Optimization (Module Credit: 4)

Course offered from : School of Science / Mathematics

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Toh Kim Chuan (Click to view profile)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Monday), 1600-1800 Room: (S17-0404)

Every Week (Thursday), 1600-1800, Room: (S17-0404)

Learning Outcomes

This module provides a comprehensive introduction to the basic theory and algorithms for nonlinear optimization problems with polyhedral and non-polyhedral constraints. Major topics to be covered include: smooth optimization, constraint qualifications, second order necessary and sufficient conditions, composite nonsmooth optimization, first and second order methods for large scale problems.

Offered in AY2017/2018 (Semester 2) (Subject to changes, Please refer to IVLE for latest updates)

Prerequisite: MA3252 Linear and Network Optimisation or BDC6111/IE6001 Foundations on Optimization or departmental approval

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :0

no. of hours for preparatory work by a student per week :7

Module Code: MA5248 - Stochastic Analysis in Mathematical Finance (Module Credit: 4)

Course offered from : School of Science / Mathematics

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Zhou Chao(Click to view profile)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Tuesday), 1900-2200, Room: SL1-LT33 (Lecture)

Learning Outcomes

This module introduces the basic techniques in stochastic analysis as well as their applications in mathematical finance. Major topics: Brownian motion, stochastic calculus, stochastic differential equations, mathematical markets, arbitrage, completeness, optimal stopping problems, stochastic control, risk-neutral pricing, and generalized Black-Scholes models.

Offered in AY2017/2018 (Semester 1) (Subject to changes, Please refer to IVLE for latest updates)

Prerequisite: MA4262 or MA3245 or MA4269 or departmental approval

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :1

no. of hours for preparatory work by a student per week :6

Module Code: ST5214 - Advanced Probability Theory (Module Credit: 4)

Course offered from : School of Science / Statistics & Applied Probability

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Choi Kwok Pui (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Monday), 1000-1200, Room: S16-06118

Every Week (Wednesday), 1000-1200, Room: S16-06118

Learning Outcomes

Probability measures and their distribution functions. Random variable: properties of mathematical expectation, independence, conditional probability and expectation. Convergence concepts: various modes of convergence of sequence of random variables; almost sure convergence, Borel-Cantelli Lemma, uniform integrability, convergence of moments. Weak and strong law of large numbers. Convergence in distribution, characteristic function: general properties, convolution, uniqueness and inversion, Lindeberg conditions and central limit theorem. This module is targeted at students who are interested in Statistics and are able to meet the pre-requisites.

Prerequisite: ST2131 or Departmental approval (compulsory to MSc by Research and AMP students)

Preclusions: MA5259

Offered in semester 1 in AY2017/2018

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:1

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :3

no. of hours for preparatory work by a student per week :3

Module Code: EC5101 - Microeconomic Theory (Module Credit: 4)

Course offered from : Arts & Social Sciences / Economics

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Luo Xiao , Quah Kim Ho, John (Click to view profile)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Friday), 0900-1300, Room: AS2-0413

Learning Outcomes

The purpose of this course is to provide students with a sound understanding of modern microeconomic theory. Microeconomic theory is concerned with the behaviour of individual economic agents such as individual people, households, firms and single industries. The course presents a rigorous treatment of the principles governing individual behaviour and an introduction to general equilibrium analysis. Other topics that will be covered include game theory, information economics, and welfare economics. Knowledge of basic mathematics is necessary. This includes equations, coordinate geometry, functions of several variables, real analysis, calculus, and vector algebra.

Offered in semester 1 in AY2017/2018

Workload Components

no. of lecture hours per week :2

no. of tutorial hours per week:1

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :2

no. of hours for preparatory work by a student per week :5

Module Code: EC6101 - Advanced Microeconomic Theory (Module Credit: 4)

Course offered from : Arts & Social Sciences / Economics

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) Lecturer

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Thursday), 0900-1300, Room: AS1-0203

Learning Outcomes

As an essential module for economics PhD students, this module aims to equip them with the tools of modern microeconomic theory and prepare them to be independent researchers. As a subsequent module following EC5101, this module focuses on general equilibrium and welfare theory, game theory, and information economics.

Offered in semester 2 in AY2017/2018

Workload Components

no. of lecture hours per week :2

no. of tutorial hours per week:2

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :2

no. of hours for preparatory work by a student per week :4

Module Code: EC6312 - Advanced Game Theory (Module Credit: 4)

Course offered from : Arts & Social Sciences / Economics

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (TBC), Room: (TBC)

Learning Outcomes

This is a comprehensive introduction of modern game theory at a PhD graduate level. Topics include strategic games, extensive games, incomplete information games, repeated games, interactive epistemology, mechanism design, implementation theory, and information economics.

Offered in AY2017/2018 (TBC)

Workload Components

no. of lecture hours per week :2

no. of tutorial hours per week:1

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :0

no. of hours for preparatory work by a student per week :7

Module Code: EC6316 - Contract Theory and Applications (Module Credit: 4)

Course offered from : Arts & Social Sciences / Economics

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Wednesday), 1400-1800 Room: (AS1-0302)

Learning Outcomes

This module aims to introduce students to modern economic principles, techniques and applications of contract theory in organizations and markets. Authorities want to design incentives such that interacting players, both internal and external, take decisions that further the organization's goals. In the marketplace competition from rivals often determine an organizations internal incentives. Most of the interactions take place under asymmetric information environment about the players' actions and types. A prior, basic knowledge of game theory will be assumed for this module. Offered in semester 2 in AY2017/2018

Prerequisites: EC5101 Microeconomic Theory and EC5104 Mathematical Economic

Offered in AY2017/2018 (Semester 2) (Subject to changes, Please refer to IVLE for latest updates)

Workload Components

no. of lecture hours per week :2

no. of tutorial hours per week:1

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :2

no. of hours for preparatory work by a student per week :5

Module Code: CS5234 - Combinatorial and Graph Algorithms (Module Credit: 4)

Course offered from : School of Computing / Computer Science

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Seth Lewis Gilbert (Click to view their profile)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Thursday), 1830-2130, Room: COM1-0204

Learning Outcomes

This course presents advanced material on the design and analysis of combinatorial algorithms with emphasis on efficient algorithms and data structures. This course is meant for students who intend to (i) do research in computer science in general, and algorithm design in particular, or (ii) do advanced application/software development in other areas of computer science. (It assumes that the student has already done one course on design and analysis of algorithms equivalent to CS3230.)

Offered in semester 1 in AY2017/2018

Prerequisites: CS3230

Preclusions: CS4234

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :3

no. of hours for preparatory work by a student per week :4

Module Code: CS6234 - Advance Algorithms (Module Credit: 4)

Course offered from : School of Computing / Computer Science

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Zick,Yair (Click to view their profile)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Wednesday), 1000-1200, Room: i3-0344

Learning Outcomes

This module is aimed at graduate students who are doing or intend to do advanced research in algorithms design and analysis in all areas of computer science. The module covers advanced material on combinatorial and graph algorithms with emphasis on efficient algorithms, and explores their use in a variety of application areas. Topics covered include, but are not restricted to, linear programming, graph matching and network flows, approximation algorithms, randomized algorithms, online algorithms, local search algorithms, algorithms for large datasets. The module will be a seminar-based module that will expose students to current research in these areas.

Offered in semester 2 in AY2017/2018

Prerequisites: CS5234

Workload Components

no. of lecture hours per week :2

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :5

no. of hours for preparatory work by a student per week :3

Elective Modules (Data Analytics)

Module Code: EE6735 - Algorithms for Statistical Inference (Module Credit: 4)

Course offered from : School of Computing / Computer Science

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (TBC), Room: (TBC)

Learning Outcomes

This course introduces ECE and SoC graduate students to the fundamentals of machine learning from a statistical perspective, bringing the student to a level at which he can conduct independent research in this interdisciplinary area. The course will cover Bayesian statistics and emphasizes the powerful formalism of graphical models. We introduce exact and approximate inference and learning of graphical models, which serve as unifying themes for many models and algorithms in control, communications, speech analysis, signal processing, computer vision and biomedical image analysis, such as Kalman filtering, hidden Markov models, Viterbi algorithm and LDPC decoding.

Offered in AY2017/2018 (TBC)

Prerequisites: EE4131 Random Signals OR EE5137R Stochastic Processes

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :4

no. of hours for preparatory work by a student per week :3

Module Code: MA4270 - Data Modeling and Computation (Module Credit: 4)

Course offered from : Faculty of Science / Mathematics

Module Facilitators

Tan Yan Fu, Vincent (Click to view profile) (Subject to changes, Please refer to IVLE for latest updates)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Monday), 1400-1500, Room: SL1-LT29 (Lecture)

Every Week (Tuesday), 1400-1500, Room: S17-0405 (Tutorial)

Every Week (Thursday), 0900-1000, Room: SL1-LT29 (Lecture)

Learning Outcomes

This course aims at presenting important mathematical concepts and computational methods that are often used for modelling and analysis of big data sets and complex networks. The emphasis is on mathematical modelling and computational methods for practical problems in data science. Major topics include: basics on convex analysis, numerical methods for large-scale convex problems, dimensionality reduction, numerical methods for machine learning, kernel methods for pattern analysis, sparse coding and dictionary learning.

Offered in semester 2 in AY2017/2018

Prerequisites: MA2213 and ST3131

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:1

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :2

no. of hours for preparatory work by a student per week :4

Module Code: ST5215 - Advanced Statistical Theory (Module Credit: 4)

Course offered from : Faculty of Science / Statistics & Applied Probability

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Jasra, Ajay (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Tuesday), 1400-1600, Room: S16-06118 (Lecture)

Every Week (Thursday), 1400-1600, Room: S16-06118 (Lecture)

Learning Outcomes

Review: Weak Law of large numbers, central limit theorem, Slutsky theorem, delta method and variance stabilizing transformation. Statistical models. Sufficiency and Neyman's Factorization criterion. Scores. Exponential families. Estimation methods: moment, maximum likelihood, least squares. Optimality of estimates. Unbiasedness, minimum variance, completeness, UMVU estimates. Theorems of Rao-Blackwell, Cramer-Rao, Lehmann-Scheffe. Consistency. Large sample theory of MLE's, Bayes, minimax. Confidence intervals, P-values, classical (Neyman-Pearson) tests, UMP tests, Likelihood ratio test, Power, Wald's test, Rao's Score test, Application of likelihood ratio tests to regression. This module is targeted at students who are interested in Statistics and are able to meet the pre-requisites.

Offered in semester 1 in AY2017/2018

Prerequisites: ST2131 and ST2132 or Departmental approval

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:1

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :3

no. of hours for preparatory work by a student per week :3

Module Code: ST5224 - Advanced Statistical Theory II (Module Credit: 4)

Course offered from : Faculty of Science / Statistics & Applied Probability

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Thursday), 1400-1600, Room: S16-06118 (Lecture)

Every Week (Thursday), 1600-1700, Room: S16-06118 (Tutorial)

Learning Outcomes

Confidence intervals, P-values, classical (Neyman- Pearson) tests, UMP tests, Likelihood ratio test, Power, Wald?s test, Rao?s Score test, Application of likelihood ratio tests to regression. Additional topics that can be covered in this module includes resampling methods, Bayes procedures, robustness, times series, empirical and point processes, optimal experimental design, parametric, semiparametric and non-parametric modelling, survival analysis and sequential analysis.

Offered in semester 2 in AY2017/2018

Prerequisites: ST5215 or Departmental approval

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:1

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :3

no. of hours for preparatory work by a student per week :3

Module Code: ST5222 - Advanced Topics in Applied Statistics (Module Credit: 4)

Course offered from : Faculty of Science / Statistics & Applied Probability

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Yu Tao (Click to view profile)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Friday), 1400-1600, Room: S16-06118 (Lecture)

Every Week (Friday), 1600-1700, Room: S16-06118 (Tutorial)

Learning Outcomes

Topics requiring a high level of statistical computing and some optimization can be covered here, for example, discriminant analysis, machine learning, high dimensionality and false discovery rates, stochastic search, MCMC, Monte Carlo integration, kernel smoothing and EM optimization methods.

Offered in semester 1 in AY2017/2018

Prerequisites: Departmental approval

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:1

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :3

no. of hours for preparatory work by a student per week :3

Module Code: ST5223 - Statistical Models: Theory/Applications (Module Credit: 4)

Course offered from : Faculty of Science / Statistics & Applied Probability

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Monday), 1900-2100, Room: LT21 (Lecture)

Every Week (Monday), 2100-2200, Room: LT21 (Tutorial)

Learning Outcomes

Univariate and multivariate regression, graphical displays, normal equations, Gramm-Schmidt orthogonalization and singular value decomposition, model selection and prediction, collinearity and variable selection, diagnostics: residuals, influence, symptoms and remedies, ANOVA, fixed and random effects, nonlinear models including logistic regression, loglinear models and generalized linear models, computations with datasets using statistical computer package.

Offered in semester 2 in AY2017/2018

Prerequisites: Departmental approval

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:1

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :3

no. of hours for preparatory work by a student per week :3

Module Code: BZD6003 - Applied Econometrics I (Module Credit: 4)

Course offered from : School of Business/ Strategy and Policy

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Tuesday), 1700-2000, Room: BIZ1-SR6-1 (Lecture)

Learning Outcomes

This course covers the theoretical and practical concerns in testing real world business data. The basic building blocks of empirical research design and identification are covered. This introductory course centers on how to use observational data to test for causal relationships.

Offered in semester 1 in AY2017/2018

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :4

no. of hours for preparatory work by a student per week :3

Module Code: EC5103 - Econometric Modelling and Applications I (Module Credit: 4)

Course offered from : Faculty of Arts & Social Sciences / Economics

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

Seo Juwon , Abeysinghe,Tilak (Click to view profile)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Wednesday), 0900-1300, Room: AS1-0304

Learning Outcomes

This is an introductory level core module for graduate students. Students are required to have a background knowledge in econometrics at least at the level of EC3304 Econometrics II. Students who do not have this background will be advised to take EC3304 first as an additional module which will not be counted towards CAP. The broad topics covered include mathematical and statistical pre-requisites (matrix algebra and statistical inference), standard regression analysis (OLS, GLS, IV, ML, SUR techniques), and applications oriented topics on cointegration, panel data, and limited dependent variable models.

Offered in semester 1 in AY2017/2018

Prerequisites: EC5253/EC5304/ECA5103

Preclusions: EC5154

Workload Components

no. of lecture hours per week :2

no. of tutorial hours per week:1

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :2

no. of hours for preparatory work by a student per week :5

Module Code: EC6103 - Econometric Modelling and Applications II (Module Credit: 4)

Course offered from : Faculty of Arts & Social Sciences / Economics

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Wednesday), 0900-1300, Room: AS7-0106

Learning Outcomes

This is a core module for PhD students. It is aimed at providing a good training in econometric theory and applications. It covers some topics already covered in EC5103 but at a more theoretical level. Asymptotic theory, ML and GMM estimation, extremum estimators, non-linear models, simultaneous equations models are among the topics covered under this module.

Offered in semester 2 in AY2017/2018

Prerequisites: EC5154/EC5103

Preclusions: EC6154

Workload Components

no. of lecture hours per week :2

no. of tutorial hours per week:2

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :2

no. of hours for preparatory work by a student per week :4

Module Code: EC6313 - Topics in Econometrics (Module Credit: 4)

Course offered from : Faculty of Arts & Social Sciences / Economics

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (TBC), Room: (TBC)

Learning Outcomes

This module is designed to train students in advanced econometric applications in various areas. This is a reading-intensive course; students are required to read a large volume of journal articles in the relevant areas and analyse them. Students can make requests to cover topics that are of interest to them. This is an ideal setting for Ph.D. students to try out their thesis research topics. Topics such as Bayesian econometrics, panel regression with unit-root time series, and macroeconometric modelling for forecasting and policy analyses are likely to be covered under this module..

Offered in semester 1 in AY2017/2018

Prerequisites: EC5154/EC5103

Preclusions: EC6204

Workload Components

no. of lecture hours per week :2

no. of tutorial hours per week:2

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :2

no. of hours for preparatory work by a student per week :4

Elective Modules (OR Modeling)

Module Code: BDC6113 - FOUNDATIONS OF INVENTORY MANAGEMENT (Module Credit: 4)

Course offered from : School of Business/ Decision Sciences

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Wednesday), 0900-1200, Room: BIZ1-SR6-1 (Lecture)

Learning Outcomes

This course will provide an in-depth study of a variety of production and inventory control planning problems, the development of mathematical models corresponding to these problems, approaches to characterize solutions, and algorithm designs for finding solutions. We will cover deterministic as well as stochastic inventory models. Although many of the topics we will cover are of great interest to managers, our focus will not be on practice but on theory.

Offered in both semester 2 in AY2017/2018

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :4

no. of hours for preparatory work by a student per week :3

Module Code: BDC6114 - LOGISTICS AND SUPPLY CHAIN (Module Credit: 4)

Course offered from : School of Business/ Decision Sciences

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Tuesday), 1200-1500, Room: BIZ1-SR6-4 (Lecture)

Learning Outcomes

The objective of this course is to expose students to the issues that need to be considered in designing and operating logistics and supply chains. We will start with an introduction including definition of logistics and supply chain management, key supply chain costs and metrics, and fundamental issues and trade-offs in supply chain management. We will then discuss the interactions between stages in a supply chain, double marginalization and contracts for supply chain coordination, strategic alliances and incentive alignment, channels of distribution, coordinating distribution strategies, pricing/promotions. We will also discuss supply chain planning, facility location models, and vehicle routing models.

Offered in both semester 2 in AY2017/2018

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :4

no. of hours for preparatory work by a student per week :3

Module Code: MA5269 - Optimal Stopping and Stochastic Control in Finance (Module Credit: 4)

Course offered from : Faculty of Science / Mathematics

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (TBC), Room: (TBC)

Learning Outcomes

This module covers the fundamental theory of optimal stopping and stochastic control. Two typical examples arising from finance will be elaborated: American option pricing and portfolio selection. Major topics include optimal stopping problems, stochastic control problems, HJB equations, viscosity solution, variational inequality equations, etc.

Offered in AY2017/2018 (Subject to changes, Please refer to IVLE for latest updates)

Prerequisites: Departmental approval for non-PhD students.

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :5

no. of hours for preparatory work by a student per week :2

Module Code: EE5138R - Optimization for Communication Systems (Module Credit: 4)

Course offered from : School of Engineering / Electrical & Computer Engineering

Module Facilitators (Subject to changes, Please refer to IVLE for latest updates)

(TBC) (Lecturer)

Schedule (Subject to changes, Please refer to IVLE for latest updates)

Every Week (Friday), 1800-2100, Room: E5-03-22 (Lecture)

Learning Outcomes

The module exposes students to a variety of modelling and techniques involving optimization problem formulations in communications signal processing and networks. The topics include linear and nonlinear programming formulations, constrained and unconstrained optimization techniques, network flow models and algorithms, and convex optimization techniques. The module also helps in the understanding of the problem formulation approaches for a wide variety of applications using the methods and techniques taught in the earlier part of the course. It is intended for students to gain knowledge and use of optimization techniques pertaining to the applications in communications & signal processing and networks (wired and wireless) domains.

Offered in both semester 2 in AY2017/2018

Prerequisites: Mathematical background of an undergraduate course in ECE

Workload Components

no. of lecture hours per week :3

no. of tutorial hours per week:0

no. of lab hours per week :0

no. of hours for projects, assignments, fieldwork etc per week :3

no. of hours for preparatory work by a student per week :4