



AYDIN ADNAN MENDERES UNIVERSITY COURSE INFORMATION FORM

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|--|---|--|-------------|--|---|--------------------------------|---|------------|---|
| Course Title | | Food Process Analysis and Modelling | | | | | | | |
| Course Code | | GMP611 | | Course Level | | Third Cycle (Doctorate Degree) | | | |
| ECTS Credit | 8 | Workload | 200 (Hours) | Theory | 3 | Practice | 0 | Laboratory | 0 |
| Objectives of the Course | | In this course, aim is to give the students the ability of analysing, mathematical modelling and optimization of food process operation using data obtained from those operations | | | | | | | |
| Course Content | | Mathematical Modeling. Definition of modeling, solution of nonlinear equations and linear systems, interpolation and curve fitting, empirical models and their solutions, Fundamental principles of modeling and application to simple systems; differential equation applications, continuity, energy and motion equations, simultaneous mass and heat balances, modeling of mass transfer and diffusion, Kinetic Modeling; Rate constant, effect of temperature, activation energy, enzymatic reaction kinetics, nutrient loss and degradation kinetics, microbial kinetics and kinetics of microbial death, Mathematical modeling in Food Engineering operations: Thermal process, evaporation, freezing, drying, fat oxidation, filtration, ultrafiltration, packaging and baking, Optimization; Classical optimization, single and multivariate optimization, Lagrange multipliers, Search techniques, direct search, univariate search, multivariate search, Powell's method, Response Surface Methodology (RSM) | | | | | | | |
| Work Placement | | N/A | | | | | | | |
| Planned Learning Activities and Teaching Methods | | | | Explanation (Presentation), Experiment, Discussion, Case Study, Individual Study | | | | | |
| Name of Lecturer(s) | | | | | | | | | |

Assessment Methods and Criteria

| Method | Quantity | Percentage (%) |
|---------------------|----------|----------------|
| Midterm Examination | 1 | 30 |
| Final Examination | 1 | 50 |
| Term Assignment | 1 | 20 |

Recommended or Required Reading

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| 1 | Bird R.B., Stewart W.E., Lightfoot E.N.,1960. "Transport Phenomena". John Wiley & Sons,Inc. |
| 2 | Özilgen, M.1998. "Food Process Modeling and Control. Chemical Engineering Applications" Gordon and Breach Science Publishers |
| 3 | Tosun, İ.2002. "Modelling in Transport Phenomena. A Conceptual Approach" Elsevier Science B.V. |

| Week | Weekly Detailed Course Contents & Teaching Methods | |
|------|--|--|
| 1 | Theoretical | Mathematical Modeling. Definition of modeling, solution of nonlinear equations and linear systems, interpolation and curve fitting, empirical models and their solutions |
| 2 | Theoretical | Fundamental principles of modeling and application to simple systems; differential equation applications, continuity, energy and motion equations |
| 3 | Theoretical | Simultaneous mass and heat balances, modeling of mass transfer and diffusion |
| 4 | Theoretical | Mathematical modeling in Food Engineering operations: Examples for thermal process, evaporation, freezing, drying, oil oxidation, filtration, ultrafiltration, packaging, and baking |
| 5 | Theoretical | Mathematical modeling in Food Engineering operations: Examples for thermal process, evaporation, freezing, drying, oil oxidation, filtration, ultrafiltration, packaging, and baking |
| 6 | Theoretical | Kinetic Modeling; Rate constant, effect of temperature, activation energy, enzymatic reaction kinetics |
| 7 | Theoretical | Nutrient loss and degradation kinetics, microbial kinetics and kinetics of microbial death |
| 8 | Intermediate Exam | Midterm exam |
| 9 | Theoretical | Concept of optimization, the general method for solution of optimization problems. |
| 10 | Theoretical | Classical optimization, continuity of a function, optimization of single and multivariable functions, Method of Lagrange multipliers for the functions under restriction. |
| 11 | Theoretical | Search Techniques, Direct Search, Grid – Fibonacci – Golden Section search techniques, Quadratic search techniques (Davies-Swan-Campey and Powell methods) |
| 12 | Theoretical | Multivariable Search Techniques (Alternating variable, Pattern search and Powell methods) |
| 13 | Theoretical | Linear Programming |
| 14 | Theoretical | The general method for experimental design, Response Surface Methodology (RSM) |
| 15 | Theoretical | Industrial applications of optimization and process control standpoint |
| 16 | Final Exam | Final Exam |

Workload Calculation

| Activity | Quantity | Preparation | Duration | Total Workload |
|------------------|----------|-------------|----------|----------------|
| Lecture - Theory | 14 | 8 | 3 | 154 |



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|---|---|----|---------------------------------------|-----|
| Term Project | 1 | 20 | 2 | 22 |
| Midterm Examination | 1 | 10 | 2 | 12 |
| Final Examination | 1 | 10 | 2 | 12 |
| | | | Total Workload (Hours) | 200 |
| | | | [Total Workload (Hours) / 25*] = ECTS | 8 |
| *25 hour workload is accepted as 1 ECTS | | | | |

Learning Outcomes

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| 1 | |
| 2 | |
| 3 | |
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| 8 | |
| 9 | |
| 10 | |

Programme Outcomes (Food Engineering Doctorate)

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|---|--|
| 1 | Developing and investigating the details of current and advanced knowledge in the field of Food Engineering by original thought and/or research on the level of expertise based on the graduate qualification and reaching to the original definitions that bring innovation to science. |
| 2 | Gain of ability of develop strategies, policies and implementation plans in the field of food engineering and evaluate the results within the framework of quality processes. |
| 3 | Gain of ability to perceive, design, evaluate and finish an original process by using and following the knowledge of the recent developments in the engineering fields. |
| 4 | Gain of ability of making critical analysis, synthesis and evaluation of ideas and development in food engineering field |
| 5 | Having advanced knowledge of food science and its applications based on doctoral level qualifications. |

Contribution of Learning Outcomes to Programme Outcomes 1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High

| | L1 | L2 | L3 | L4 | L5 | L6 | L7 | L8 | L9 | L10 |
|----|----|----|----|----|----|----|----|----|----|-----|
| P1 | | | | | 5 | 5 | 5 | 1 | 1 | 1 |
| P2 | | | | 5 | 5 | 5 | 5 | | | |
| P3 | 5 | 5 | 5 | 5 | 5 | 5 | | | | |
| P5 | | | | | | 5 | | | | |

