**AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAMME**

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| **First Year** | | | | | | | | |
| **I. Semester** | | | | | | | | |
| Code | Course Title | | ECTS | T+P | Credit | C/E | Language | |
| 501011101 | [THE SCIENTIFIC RESEARCH METHODS AND ITS ETHICS](#EN18) | | 7.5 | 3+0 | 3 | **C** | Turkish | |
| 506702504 | | [AVIATIONS MATERIALS](#EN13) | 7.5 | 3+0 | 3 | **C** | Turkish |
|  | Elective Course-1 | | 7.5 | 3+0 | 3 | E | Turkish | |
|  | Elective Course-2 | | 7.5 | 3+0 | 3 | E | Turkish | |
|  | Total of I. Semester | | 30 |  | 12 |  |  | |
| **II. Semester** | | | | | | | | |
| Code | Course Title | | ECTS | T+P | Credit | C/E | Language | |
|  | Elective Course-3 | | 7.5 | 3+0 | 3 | E | Turkish | |
|  | Elective Course-4 | | 7.5 | 3+0 | 3 | E | Turkish | |
|  | Elective Course-5 | | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702001 | Seminar | | 7.5 | 0+1 | - | **C** | Turkish | |
|  | Total of II. Semester | | 30 |  | 9 |  |  | |
|  | TOTAL OF FIRST YEAR | | 60 |  | 21 |  |  | |

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| **Second Year** | | | | | | | | |
| **III. Semester** | | | | | | | | | |
| Code | Course Title | | ECTS | | T+P | Credit | C/E | Language |
| 506701702 | MSc THESIS STUDY | | 25 | | 0+1 | - | **C** | Turkish |
| 506701703 | SPECIALIZATION FIELD COURSE | | 5 | | 3+0 | - | **C** | Turkish |
|  | | Total of III. Semester | 30 |  | |  |  |  | |
| **IV. Semester** | | | | | | | | | |
| Code | | Course Title | ECTS | T+P | | Credit | C/E | Language | |
| 506701702 | | MSc THESIS STUDY | 25 | 0+1 | | - | **C** | Turkish | |
| 506701703 | | SPECIALIZATION FIELD COURSE | 5 | 3+0 | | - | **C** | Turkish | |
|  | | Total of IV. Semester | 30 |  | |  |  |  | |
|  | | TOTAL OF SECOND YEAR | 60 |  | |  |  |  | |

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| **Elective Courses** | | | | | | | | |
| Code | | Course Title | ECTS | T+P | Credit | C/E | Language | |
| 506701509 | | [ADDITIVE MANUFACTURING](#EN28) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506701501 | | [ADVANCED COMPOSITES MATERIALS](#EN7) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702505 | | [ADVANCED PRODUCTION TECHLOLOGIES IN AEROSPACE INDUSTRY](#EN20) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702510 | | [HUMAN FACTORS ON AVIATION](#EN40) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702509 | | [ADVANCED THERMODYNAMICS OF AIRCRAFT GAS TURBINE ENGINES](#EN41) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506701504 | | [AEROSPACE AND AVIATION ERGONOMY](#EN16) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702513 | | [AIR VEHICLE DESIGN AND OPTIMIZATION](#EN23) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506701508 | | [AIRCRAFT DESIGN PARAMETERS](#EN26) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506701901 | | [AIRCRAFT FUSELAGE](#EN14) | 7.5 | 3+0 | 3 | E | English |
| 506701512 | | [AIRCRAFT PERFORMANCE AND OPERATIONAL ANALYSIS](#EN35) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702520 | | [Airport System and Design](#EN37) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702502 | | [CHARACTERIZATION OF AEROSPACE MATERIALS](#EN9) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506701505 | | [CONTROL THEORY IN GAS TURBINE ENGINES](#EN15) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702519 | | [Exergoeconomic analysis of gas turbine engines](#EN38) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702521 | | [Hybrid Propulsion Systems and Aviation Applications](#EN39) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506701506 | | [FAILURE ANALYSIS IN AEROSPACE](#EN27) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702511 | | [FINITE ELEMENT METHOD AND APPLICATIONS IN AVIAATION INDUSTRY](#EN22). | 7.5 | 3+0 | 3 | E | Turkish | |
| 506701507 | | [FLIGHT MECHANICS AND AIRCRAFT PERFOEMANCE](#EN25) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702507 | | [FLIGHT PROCEDURES AND AIRSPACE DESIGN](#EN30) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702503 | | [FUSELAGES](#EN12) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702510 | | [HUMAN FACTORS ON AVIATION](#EN32) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702508 | | [INTRODUCTION TO MINI DRONE SYSTEMS](#EN31) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702506 | | [MECHANICAL AND ELECTRICAL INTEGRATION OF AIRCRAFT SYSTEMS](#EN19) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702512 | | [MILITARY OPERATIONAL ANALYSIS MODELLING](#EN24) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506701502 | [NONDESTRUCTIVE TEST METHODS](#EN1) | | 7.5 | 3+0 | 3 | E | Turkish | | |
| 506701510 | | [PARTICLE IMAGE VELOCIMETRY ANALYSIS](#EN33) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702514 | | [PERFORMANCE OF AIRCRAFT](#EN21) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506701511 | | [SUPERALLOYS](#EN34) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506701515 | | [Turbofan Engine Systems](#EN36) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506702501 | | [UNMANNED AERIAL VEHICLE AND PROPULSION SYSTEMS](#EN8) | 7.5 | 3+0 | 3 | E | Turkish | |
| 506701503 | | [WAVE PROPAGATION IN SOLID MEDIA](#EN17) | 7.5 | 3+0 | 3 | E | Turkish | |

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**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506701502 | **TITLE** | Nondestructive Test Methods |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | To explain the importance of non-destructive test. To improve knowledge about inspection methods. The definitions and classifications of non-destructive test methods, (ultrasonic inspection, radiography, eddy current, magnetic particle, penetrant, flux leakage and visual examination). | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1.Design and conduct experiments as well as to analyze and interpret data  2.Design a system, component, or process to meet desired needs  3.Get a recognition of the need for, and an ability to engage in life-long learning  4.Gain a knowledge of contemporary issues  5.Apply knowledge of mathematics, science, and engineering  6.Identify, formulate, and solve engineering problems | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students taking this course will have information about the non-destructive testing methods. Engineering concept of the importance of non-destructive control and manufacturing applications. Designing applications related to non-destructive inspection methods, and gain the ability to analyze. What methods of assessment of the system that can be applied. | | | | | | | |
| **TEXTBOOK** | | | | | Non-Destructive Testing, R. Halmshaw, Edward Arnold Press, London, 1991 | | | | | | | |
| **OTHER REFERENCES** | | | | | Introduction to nondestructive testing : a training guide, Mix, Paul E., Printed in The USA, 2001Handbook of Nondestructive Evoluation, Charles J. Hellier, Mc Graw Hill, 2001 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | ntroduction, definition of homework subjects |
| 2 | Eye examination |
| 3 | Welding defects and causes |
| 4 | Penetrant testing |
| 5 | Radiographic testing |
| 6 | Midterm Examination 1 |
| 7 | Ultrasonography |
| 8 | Eddy Current testing |
| 9 | Magnetic Particulate testing |
| 10 | Thermal visions testing |
| 11 | Midterm Examination 2 |
| 12 | Acoustic Emmisions |
| 13 | Home work presentations |
| 14 | Home work presentations |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Assoc.Prof.Dr. Osman Nuri ÇELİK | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MECHANICAL ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503701509 | **TITLE** | MODERN CONTROL SYSTEMS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | State variable and input-output descriptions of linear continuous-time and discrete-time systems. Solution of linear system dynamical equations. Controllability and observability. Canonical descriptions of linear equations. Irreducible realizations of rational transfer function matrices. Canonical form dynamical equations. State feedback and state estimators. Decoupling by state feedback. Stability of linear dynamical systems and Lyapunov theorem. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To learn fundamentals of linear control theory and its implications into the applied engineering | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To earn skills required for design and control of linear systems | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | By the end of this module students will be able to:  1) gain the knowledge of how to investigate the system behaviour of input-output systems  2) understand and analyze the effects of different inputs to the output signal of the system,  3) learn how to synthesise a controller that results in specific prescribed system behaviour  4) design Lyapunov stable control system implementations | | | | | | | |
| **TEXTBOOK** | | | | | Chen C.T. Linear System Theory and Design, Oxford University Press | | | | | | | |
| **OTHER REFERENCES** | | | | | Lecture Notes | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction : Linear State Space Equations, Linearization |
| 2 | Mathematical Descriptions Of Systems: Input-Output Description, State Variable Description |
| 3 | Comparisons Of Input-Output Description And The State Variable Description |
| 4 | Interconnections Of Linear Systems, Interconnections Of Linear Time Invariant Systems |
| 5 | Linear Dynamical Equations And Impulse-Response Matrices, Solutions Of Dynamical Equations  Eigenvalues, Eigenvectors, Jordan Form, Functions Of A Square Matrix Model Decomposition |
| 6 | Midterm Examination 1 |
| 7 | Equivalent Dynamical Equations, Impulse-Response Matrices And Dynamical Equations |
| 8 | Controllability And Observability Of State Space Systems |
| 9 | Duality Of Controllability And Observability |
| 10 | Canonical Decomposition Of Linear Time Invariant Dynamical Equation, Irreducibility (Minimal State Space Realization), Directional Variations (Degree Of Controllability And Observability) |
| 11 | Midterm Examination 2 |
| 12 | State Feedback And State Estimation |
| 13 | Stability Of Linear Systems In Terms Of Input-Output Description & State-Space Description |
| 14 | Lyapunov Theorem |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MECHANICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficient knowledge of mechanical engineering subjects related with science and own branch; an ability to apply theoretical and practical knowledge on solving and modeling of engineering problems. |  |  |  |
| **LO 2** | Ability to determine, define, formulate and solve complex mechanical engineering problems; for that purpose an ability to select and use convenient analytical and experimental methods. |  |  |  |
| **LO 3** | Ability to design a complex system, a component and/or an engineering process under real life constrains or conditions, defined by environmental, economical and political problems; for that purpose an ability to apply modern design methods. |  |  |  |
| **LO 4** | Ability to develop, select and use modern methods and tools required for mechanical engineering applications; ability to effective use of information technologies. |  |  |  |
| **LO 5** | In order to investigate mechanical engineering problems; ability to set up and conduct experiments and ability to analyze and interpretation of experimental results. |  |  |  |
| **LO 6** | Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence. |  |  |  |
| **LO 7** | Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language. |  |  |  |
| **LO 8** | Awareness of life-long learning; ability to reach information; follow developments in science and technology and continuous self-improvement. |  |  |  |
| **LO 9** | Understanding of professional and ethical issues and taking responsibility |  |  |  |
| **LO 10** | Awareness of project, risk and change management; awareness of entrepreneurship, innovativeness and sustainable development. |  |  |  |
| **LO 11** | Knowledge of actual problems and effects of mechanical engineering applications on health, environment and security in global and social scale; an awareness of juridical results of engineering solutions. |  |  |  |

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| **Prepared by :** | Assoc. Prof. Dr. Naci Zafer | **Date:** | 15 May 2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MECHANICAL ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503701610 | **TITLE** | VIBRATION ANALYSIS & CONTROL IN MECHANICAL SYSTEMS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The course aims to teach modeling, detection, elimination and control of noise & vibrations in machines. It provides comprehensive analysis of the tools in vibrational analysis, modeling/measurement and control. The specific topics addressed are: dynamic modeling & analysis, isolation techniques, vibration sources, vibration measurement and data analysis, vibration transducers, modal analysis, FFT, filtering, windowing, control of vibrations. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1) to provide practical knowledge on mechanical vibrations,  2) to teach how to analyze vibration behavior characteristics,  3) to study approches used in preventing and controlling vibrations | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students learn, by taking this course, how to model, eliminate and control machine vibrations. The course also aims to make them understand in detail the techniques of elimination and control of noise and vibrations. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | By the end of this module students will be able to:  1) model and analyze vibrations in machinery,  2) learn how to determine vibration and noise sources,  3) gain insight into vibration isolation and elimination techniques,  4) learn practical aspects of vibration analysis & control techniques,  5) understand the importance of condition monitoring. | | | | | | | |
| **TEXTBOOK** | | | | | Vibration of Discrete and Continuous Systems, A.A. Shabana, Springer | | | | | | | |
| **OTHER REFERENCES** | | | | | Lecture Notes | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction: Mechanical Vibrations Review |
| 2 | Vibration Sources, Directions, Detection, Effects, Isolation and Prevention; Noise |
| 3 | Vibration Analysis: Spectrum: FFT, Interpretation, Periodic Measurements |
| 4 | Vibration Analysis: Data Collection and Processing, Test Conditions , Vib Pattern, Waveform (RMS, Peak-to-Peak), Vib Standards, Demodulation; Practical Applications |
| 5 | Waveform Analysis: Signal Conditioning, Modulation, Beating, Clipped Vibs etc.; Commonly Faced Issues (Impacting, Unbalance, Misalignment, Looseness, Damaged Parts, Cavities etc.) |
| 6 | Midterm Examination 1 |
| 7 | Frequency Domain Analysis (Fourier Transform & FFT) |
| 8 | Matlab: Signals and FFT, Convolution, Sampling |
| 9 | Matlab: Signals with Noise, Filtering (Bandpass) |
| 10 | Nyquist-Shannon theorem, Anti-Aliasing filter, Frequency leakage |
| 11 | Midterm Examination 2 |
| 12 | Filter Types (Butterworth, Chebyshev, Bessel, Elliptical), Frequency Responses |
| 13 | Signal Parameters for a Random Signal, Windowing (Hanning and Rectangular) |
| 14 | Control of Vibrations (Passive, Semi-Active & Active) |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MECHANICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficient knowledge of mechanical engineering subjects related with science and own branch; an ability to apply theoretical and practical knowledge on solving and modeling of engineering problems. |  |  |  |
| **LO 2** | Ability to determine, define, formulate and solve complex mechanical engineering problems; for that purpose an ability to select and use convenient analytical and experimental methods. |  |  |  |
| **LO 3** | Ability to design a complex system, a component and/or an engineering process under real life constrains or conditions, defined by environmental, economical and political problems; for that purpose an ability to apply modern design methods. |  |  |  |
| **LO 4** | Ability to develop, select and use modern methods and tools required for mechanical engineering applications; ability to effective use of information technologies. |  |  |  |
| **LO 5** | In order to investigate mechanical engineering problems; ability to set up and conduct experiments and ability to analyze and interpretation of experimental results. |  |  |  |
| **LO 6** | Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence. |  |  |  |
| **LO 7** | Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language. |  |  |  |
| **LO 8** | Awareness of life-long learning; ability to reach information; follow developments in science and technology and continuous self-improvement. |  |  |  |
| **LO 9** | Understanding of professional and ethical issues and taking responsibility |  |  |  |
| **LO 10** | Awareness of project, risk and change management; awareness of entrepreneurship, innovativeness and sustainable development. |  |  |  |
| **LO 11** | Knowledge of actual problems and effects of mechanical engineering applications on health, environment and security in global and social scale; an awareness of juridical results of engineering solutions. |  |  |  |

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| **Prepared by :** | Assoc. Prof. Dr. Naci Zafer | **Date:** | 15 May 2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MECHANICAL ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503702520 | **TITLE** | FUELS AND FUNDAMENTALS OF COMBUSTION |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | - | - | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | | 3 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | | 1 | | 60 |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | |  |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | First and the second laws of thermodynamics, gas mixtures, fuels, theoretical and real combustion process, enthalpy of formation, first law analysis of reacting systems and adiabatic flame temperature, second law analysis and entropy change of reacting systems, chemical equilibrium, equilibrium constant for ideal gas mixtures, chemical equilibrium for simultaneous reactions and phase equilibrium. Moreover scientific search, report, oral presentation and discussion at the field of fuels and combustion. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The objective of the course is to teach about thermodynamic laws, properties of gas mixtures, combustion process, to conduct first and second law analysis of chemical reacting systems, to define chemical equilibrium and equilibrium constant, to teach about equilibrium of simultaneous combustion reactions and equilibrium of different phases. . Beside these; to improve one’s proficiency of research, report and presentation abilities. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students taken the course shall know the first and the second laws of thermodynamics, rules of gas mixtures, hydrocarbon fuels and theoretical and practical combustion process. He/she can calculates enthalpy of formation and adiabatic flame temperature, and can conduct analysis of the first and the second laws on chemically reacting systems, and can understands equilibrium concept, defines equilibrium constants of ideal gas mixtures. One can calculate equilibrium constants of simultaneous reactions and different phases. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Defines laws of thermodynamics. 2. Calculates properties of gas mixtures. 3. Understands concept of fuel and recognizes hydrocarbon types. 4. Balances theoretical and practical combustion process. 5. Calculates formation of enthalpy and adiabatic flame temperature. 6. Conducts analyzes of the first and second laws of thermodynamics on chemically reacting systems. 7. Defines equilibrium constant. 8. Calculates equilibrium constants for ideal gas mixtures, simultaneous reactions and for different phases. 9. Develops proficiency of doing research, report, present and discuss on combustion related subject. | | | | | | | |
| **TEXTBOOK** | | | | | Yunus Ali Çengel and Michael A. Boles, “ Thermodynamics: An Engineering Approach ”, McGraw-Hill Book Company, 1989.F. El-Mahallawy and S. El-Din Habik, Fundamentals and Technology of Combustion, Elsevier 2002 | | | | | | | |
| **OTHER REFERENCES** | | | | | Turns, S.R. An Introduction to Combustion. McGraw Hill, 2011Kuo, K.K. (2005). Principles of Combustion. Wiley-Interscience, 2005 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | First and Second Laws of Thermodynamics |
| 2 | Ideal Gas Mixtures |
| 3 | Hydrocarbon Fuels |
| 4 | Theoretical and Practical Combustion Process |
| 5 | Enthalpy of Formation and Combustion Enthalpy |
| 6 | Midterm Examination 1 |
| 7 | First law analysis of reacting systems and Adiabatic Flame Temperature |
| 8 | Second Law Analysis of Reacting Systems and Entropy Change |
| 9 | Chemical Equilibrium |
| 10 | Equilibrium Constant for Ideal Gas Mixtures |
| 11 | Midterm Examination 2 |
| 12 | Chemical Equilibrium of Simultaneous Reactions and Phase Equilibrium |
| 13 | Scientific search, report and presentation |
| 14 | Scientific search, report and presentation |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MECHANICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficient knowledge of mechanical engineering subjects related with science and own branch; an ability to apply theoretical and practical knowledge on solving and modeling of engineering problems. |  |  |  |
| **LO 2** | Ability to determine, define, formulate and solve complex mechanical engineering problems; for that purpose an ability to select and use convenient analytical and experimental methods. |  |  |  |
| **LO 3** | Ability to design a complex system, a component and/or an engineering process under real life constrains or conditions, defined by environmental, economical and political problems; for that purpose an ability to apply modern design methods. |  |  |  |
| **LO 4** | Ability to develop, select and use modern methods and tools required for mechanical engineering applications; ability to effective use of information technologies. |  |  |  |
| **LO 5** | In order to investigate mechanical engineering problems; ability to set up and conduct experiments and ability to analyze and interpretation of experimental results. |  |  |  |
| **LO 6** | Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence. |  |  |  |
| **LO 7** | Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language. |  |  |  |
| **LO 8** | Awareness of life-long learning; ability to reach information; follow developments in science and technology and continuous self-improvement. |  |  |  |
| **LO 9** | Understanding of professional and ethical issues and taking responsibility |  |  |  |
| **LO 10** | Awareness of project, risk and change management; awareness of entrepreneurship, innovativeness and sustainable development. |  |  |  |
| **LO 11** | Knowledge of actual problems and effects of mechanical engineering applications on health, environment and security in global and social scale; an awareness of juridical results of engineering solutions. |  |  |  |

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| **Prepared by :** | DOÇ. DR. MUSTAFA ERTUNÇ TAT | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **EPARTMENT** | **ELECTRICAL ELECTRONICS ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503111605 | **TITLE** | Power Electronics I |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | 3 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 2 | | 30 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | AC modeling of power electronic converters, converter transfer functions, control system design, design and simulation of closed-loop controlled inverters, gate drivers, switching losses, snubbers, digital control basics, design and simulation of digitally controlled UPS systems. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach the use of basic power electronic and control system knowledge to the practical power electronic applications. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Ability to develop, select and use modern methods and tools required for engineering applications; ability to effective use of computer technologies. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students who take this course will have the skills to analyze the steady-state and dynamic response of the converters and perform designs based on the realistic specifications, also to verify their designs via simulations | | | | | | | |
| **TEXTBOOK** | | | | | R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics,” 2nd Edition. | | | | | | | |
| **OTHER REFERENCES** | | | | | Mohan, N., T.M. Undeland, and W.P. Robbins, Power Electronics: Converters, Applications, and Design, 3rd Edition, John Wiley, 2002.Krein, Philip T., Elements of Power Electronics, Oxford University Press, 1998.Kassakian, J. G., Schlecht, M. F., and Verghese, G. C., Principles of Power Electronics, Addison-Wesley, 1991.S. Buso and P. Mattavelli, “Digital Control in Power Electronics,” 1st Edition.F. L. Luo, H. Ye, M. Rashid, “Digital Power Electronics and Applications,” | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Review of DC-DC and DC-AC converter basics |
| 2 | State-space equations of power converters |
| 3 | Development of AC models of converters based on the circuit averaging techniques |
| 4 | Perturbation and linearization |
| 5 | Transfer functions of converters and PWM modulators |
| 6 | Midterm Examination 1 |
| 7 | Linear compensator types and design methods |
| 8 | Control system design of converters |
| 9 | Design and simulation of closed-loop control of SPWM inverters |
| 10 | Design and simulation of closed-loop control of SVPWM inverters |
| 11 | Midterm Examination 2 |
| 12 | Gate drives and switching losses, snubber circuit types and design |
| 13 | Digital control basics |
| 14 | Design and simulation of digitally controlled UPS systems |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE ELECTRICAL ELECTRONICS ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to apply knowledge of mathematics, basic sciences and engineering in expertise level in Electrical-Electronics Engineering and other related areas. |  |  |  |
| **LO 2** | Developing new and original ideas and methods; ability to develop innovative/alternative solutions in system, component or process design. |  |  |  |
| **LO 3** | Ability to design, plan, manage, finalize, and implement innovative multi-disciplinary works |  |  |  |
| **LO 4** | Ability to present and publish academic studies in any academic environment |  |  |  |
| **LO 5** | Ability to use a foreign language at an advanced level, ability to communicate in oral and written forms. |  |  |  |
| **LO 6** | Ability to make critical analysis, synthesis and evaluation of ideas and developments in the area of work. |  |  |  |
| **LO 7** | Advanced level of Professional and ethical responsibility. |  |  |  |

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| **Prepared by :** | Asst. Prof. Dr. Bünyamin TAMYÜREK | **Date:** | 11.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **ELECTRICAL ELECTRONICS ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503112611 | **TITLE** | Power Electronics II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | 3 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 2 | | 30 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Soft switching techniques, high power quality rectfieirs, residenatial and industrial applications, power system applications, energy storage applications and active filters | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach the use of basic power electronic knowledge to the practical power electronic applications | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Ability to develop, select and use modern methods and tools required for engineering applications; ability to effective use of computer technologies | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Having taken this course, students will learn the applications of power electronics knowledge in homes, in industry, and in electric utility. They will also learn the important criteria in developing commercially viable products | | | | | | | |
| **TEXTBOOK** | | | | | Mohan, N., T.M. Undeland, and W.P. Robbins, Power Electronics: Converters, Applications, and Design, 3rd Edition, John Wiley, 2002.R. W. | | | | | | | |
| **OTHER REFERENCES** | | | | | Erickson and D. Maksimovic, “Fundamentals of Power Electronics,” 2nd Edition.Krein, Philip T., Elements of Power Electronics, Oxford University Press, 1998.Kassakian, J. G., Schlecht, M. F., and Verghese, G. C., Principles of Power Electronics, Addison-Wesley, 1991.S. Buso and P. Mattavelli, “Digital Control in Power Electronics,” 1st Edition.F. L. Luo, H. Ye, M. Rashid, “Digital Power Electronics and Applications,” 1st Edition | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Review of semiconductor power devices |
| 2 | Soft switching techniques |
| 3 | ZCS, ZVS and ZVT |
| 4 | High power quality rectifiers |
| 5 | Flyback and other topologies |
| 6 | Midterm Examination 1 |
| 7 | Interleaved method and applications |
| 8 | Residential and industrial applications |
| 9 | PV inverters |
| 10 | Induction heating applications |
| 11 | Midterm Examination 2 |
| 12 | Power system applications |
| 13 | Energy storage applications |
| 14 | Active filters |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE ELECTRICAL ELECTRONICS ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to apply knowledge of mathematics, basic sciences and engineering in expertise level in Electrical-Electronics Engineering and other related areas. |  |  |  |
| **LO 2** | Developing new and original ideas and methods; ability to develop innovative/alternative solutions in system, component or process design. |  |  |  |
| **LO 3** | Ability to design, plan, manage, finalize, and implement innovative multi-disciplinary works |  |  |  |
| **LO 4** | Ability to present and publish academic studies in any academic environment |  |  |  |
| **LO 5** | Ability to use a foreign language at an advanced level, ability to communicate in oral and written forms. |  |  |  |
| **LO 6** | Ability to make critical analysis, synthesis and evaluation of ideas and developments in the area of work. |  |  |  |
| **LO 7** | Advanced level of Professional and ethical responsibility. |  |  |  |

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| **Prepared by :** | Asst. Prof. Dr. Bünyamin TAMYÜREK | **Date:** | 11.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Advanced composite materials |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 6 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | Non | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Definition of composite materials, production methods, theoretical and computational methods and experimental measurements. Sampling for composite materials used in the aerospace industry | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to introduce composite materials and methods of production of these materials, theoretical and computational methods and experimental measurements give information about the techniques used in the aerospace industryé | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The course will give the knowledge of on advanced composite materials used in the aerospace industry, manufacturing methods, theoretical and computational methods and experimental measurements. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1- Description of composite materials and their use.  2- Explanation of composite materials with superior properties compared to other materials.  3-selection and application of composite materials in the aerospace industry.  4-Analyzing the mechanical properties of composite materials. | | | | | | | |
| **TEXTBOOK** | | | | | 1- Kompozit Malzemelere Giriş, Prof. Dr. Yusuf Şahin 2- kompozit Malzeme, Halit yaşa Ersoy 3- Composites and Their Applications, Editor Ning Hu ISBN 978-953-51-0706-4, 424 pages, August, 2012. 4- Nanocomposites with Unique Properties and Applications in Medicine and Industry, Editor John Cuppoletti, ISBN 978-953-307-351-4 360 pages, August, 2011.5- Metal, Ceramic and Polymeric Composites for Various UsesEdited by John Cuppoletti, ISBN 978-953-307-353-8, 684. | | | | | | | |
| **OTHER REFERENCES** | | | | | Aerospace Materials Edited by Brian Cantor , Patrick Grant , and Hazel Assender, Taylor & Francis 2001 Print ISBN: 978-0-7503-0742-0, eBook ISBN: 978-1-4200-3472-1 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Application of Composite Materials |
| 2 | Reinforcement material in composites |
| 3 | Matrix materials in composite materials |
| 4 | Composite material types (polymer-metal) |
| 5 | Types of composite materials (ceramics and carbon, carbon fiber, and multiple superconducting matrix composite) |
| 6 | Midterm Examination 1 |
| 7 | Micro-and macro-mechanical behavior of composites |
| 8 | Composite Materials Fabrication Techniques |
| 9 | Composite materials used in aerospace |
| 10 | Importance of Aerospace Technology and Application of Nano |
| 11 | Midterm Examination 2 |
| 12 | The design of composite materials |
| 13 | Paper presentations |
| 14 | Paper presentations |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | |  | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Unmanned Aerial Vehicle and Propulsion Systems |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | |  |  | COMPULSORY  (   ) | | ELECTIVE  ( X ) | TUR or ENG |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | | X | | | | 2 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 30 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Within the scope of this course, information about parametrical sizing and preliminary design of Unmanned Aerial Vehicles (UAV) and Gas Turbine engines (turbofan etc.) will be given and the effects of design parameters will be examined in the final size and performance of UAV and its engine. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Gaining ability and competency to perform parametric sizing of Unmanned Aerial Vehicles (UAV) and Gas Turbine engines and their performance calculations and evaluation of results. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Today, Unmanned Aerial Vehicles (UAV) are used in both civil and military area with increasing importance. Examples include UAVs like the 'Global Hawk' with turbofan engine and 'Predator B' with turboprop engine. The development of this type of UAVs and their engines are in the vision of our country. This course will contribute to Mechanical/Aerospace engineers who may work in this field. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Getting information about Unmanned Aerial Vehicles (UAV) and Gas Turbine engines. Gripping the parametric sizing and performance calculations. Performing numerical applications in the course. Analyzing the results. Completing the assignments/projects by synthesizing the learnings. Evaluating the results of application /task /project. | | | | | | | |
| **TEXTBOOK** | | | | | -Raymer D.P., Aircraft Design: A Conceptual Approach, 3rd Edition, 1999.-Walsh, P. P. , Fletcher, P., Gas Turbine Performance, 2nd Edition, 2004. | | | | | | | |
| **OTHER REFERENCES** | | | | | -Chaput J.A., Aircraft Design and Laboratory, Conceptual Design of UAV Systems, Lecture Notes, 2004.-Mattingly, J., Heiser, W., Pratt, D., Aircraft Engine Design, AIAA Series, 2002.-Kerrebrock J.L., Aircraft Engines and Gas Turbines, MIT, 1984. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Unmanned Air Vehicles and Mission Profiles |
| 2 | Unmanned Air Vehicle Subsystems |
| 3 | Engine Types Used in Aeronautics, General Utilization Limits and Engine Selection by Mission Profile |
| 4 | Turbofan Engine Parametric Cycle Analysis |
| 5 | Turbofan Engine Parametric Cycle Analysis |
| 6 | Midterm Examination 1 |
| 7 | Sizing of Unmanned Air Vehicle |
| 8 | Sizing of Unmanned Air Vehicle |
| 9 | Performance Calculations for Unmanned Air Vehicles |
| 10 | Performance Calculations for Unmanned Air Vehicles |
| 11 | Midterm Examination 2 |
| 12 | Joint Unmanned Aerial Vehicle and Engine Sizing and Preliminary Design Calculations |
| 13 | Joint Unmanned Aerial Vehicle and Engine Sizing and Preliminary Design Calculations |
| 14 | Discussion of Results |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Dr.Ali DİNÇ (Tusaş Motor San. A.Ş.) | **Date:** | | 26.11.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Characterization of Aerospace Materialss |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 6 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | Non | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Definition of composite materials, production methods, theoretical and computational methods and experimental measurements. Sampling for composite materials used in the aerospace industry. Characterization of physical, chemical and mechanical properties of materials used in aerospace such as metal and its alloys, polymers and composites. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to introduce composite materials and methods of production of these materials, theoretical and computational methods and experimental measurements give information about the techniques used in the aerospace industry. The course is to provide information about the analysis techniques used in aerospace materials. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The course will give the knowledge of on advanced composite materials used in the aerospace industry, manufacturing methods, theoretical and computational methods and experimental measurements. This course will provide knowledge on the materials and their characterisation in aerospace. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1- Description of composite materials and their use.  2- Explanation of composite materials with superior properties compared to other materials.  3-selection and application of composite materials in the aerospace industry.  4-Analyzing the mechanical properties of composite materials.  5-Definition and usage of materials used in aerospace fields.  6-Material characterization techniques explanation.  7- Selection and application of materials characterization techniques in aerospace sector.  8- Analysis of metal, ceramic, plastic and composite materials used in aerospace.  9- Bring a solution to the problems used in aerospace . | | | | | | | |
| **TEXTBOOK** | | | | | 1- Kompozit Malzemelere Giriş, Prof. Dr. Yusuf Şahin 2- kompozit Malzeme, Halit yaşa Ersoy 3- Composites and Their Applications, Editor Ning Hu ISBN 978-953-51-0706-4, 424 pages, August, 2012. 4- Nanocomposites with Unique Properties and Applications in Medicine and Industry, Editor John Cuppoletti, ISBN 978-953-307-351-4 360 pages, August, 2011.5- Metal, Ceramic and Polymeric Composites for Various UsesEdited by John Cuppoletti, ISBN 978-953-307-353-8, 684. | | | | | | | |
| **OTHER REFERENCES** | | | | | Aerospace Materials Edited by Brian Cantor , Patrick Grant , and Hazel Assender, Taylor & Francis 2001 Print ISBN: 978-0-7503-0742-0, eBook ISBN: 978-1-4200-3472-1 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Definition of aerospace Materials |
| 2 | Materials characterization techniques-metallography, thermal analysis methods |
| 3 | Materials characterization techniques-X-ray diffraction, electron microscopy |
| 4 | Materials characterization techniques-corrosion analysis |
| 5 | Mechanical properties of materials characterization techniques |
| 6 | Midterm Examination 1 |
| 7 | Materials characterization techniques, ultrasonic inspection, penetrant inspection |
| 8 | Characterization of metals and alloys |
| 9 | Characterization of Plastics |
| 10 | Characterization of ceramic materials |
| 11 | Midterm Examination 2 |
| 12 | Characterization of composite materials |
| 13 | Paper presentations |
| 14 | Paper presentations |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Yrd.Doç.Dr.Mustafa Özgür ÖTEYAKA | **Date:** | | 19.11.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MECHANICAL ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503711602 | **TITLE** | THERMOHYDRAULIC DESIGN I |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | - | - | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 2 | | 30 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Basic Considerations in Design, Modeling of Thermal Systems, Numerical Modeling and Simulation, Softwares, Acceptable Design of a Thermal System, Syntesis of Different Design Steps, Problem Formulation for Optimization, Lagrange Multipliers | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Teaching the combination of subjects given in the courses of heat transfer, thermodynamics, fluid mechanics and numerical analysis in the context of designing a thermal system | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Designing a new thermal system and analyzing conventional systems for obtaining optimum designs | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Designing a new thermal system and analyzing conventional systems for obtaining optimum designs | | | | | | | |
| **TEXTBOOK** | | | | | Yogesh Jaluria, Design and Optimization of Thermal systems, McGraw-Hill, Inc., 1998 | | | | | | | |
| **OTHER REFERENCES** | | | | | W.F. Stocker, Design of Thermal systems, McGraw-Hill, Inc., 1989. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Basic Considerations in Design |
| 3 | Basic Considerations in Design: Examples |
| 4 | Modeling of Thermal Systems and Complex Systems |
| 5 | Numerical Modeling and Simulation and Softwares |
| 6 | Midterm Examination 1 |
| 7 | Acceptable Design of a Thermal System: Introduction |
| 8 | Acceptable Design of a Thermal System |
| 9 | Syntesis of Different Design Steps |
| 10 | Problem Formulation for Optimization Introduction and Complex Enerji Systems |
| 11 | Midterm Examination 2 |
| 12 | Lagrange Multipliers: Introduction |
| 13 | Lagrange Multipliers: Thermohydroulic systems |
| 14 | Lagrange Multipliers: Power Plants |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MECHANICAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficient knowledge of mechanical engineering subjects related with science and own branch; an ability to apply theoretical and practical knowledge on solving and modeling of engineering problems. | |  |  |  |
| **LO 2** | Ability to determine, define, formulate and solve complex mechanical engineering problems; for that purpose an ability to select and use convenient analytical and experimental methods. | |  |  |  |
| **LO 3** | Ability to design a complex system, a component and/or an engineering process under real life constrains or conditions, defined by environmental, economical and political problems; for that purpose an ability to apply modern design methods. | |  |  |  |
| **LO 4** | Ability to develop, select and use modern methods and tools required for mechanical engineering applications; ability to effective use of information technologies. | |  |  |  |
| **LO 5** | In order to investigate mechanical engineering problems; ability to set up and conduct experiments and ability to analyze and interpretation of experimental results. | |  |  |  |
| **LO 6** | Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence. | |  |  |  |
| **LO 7** | Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language. | |  |  |  |
| **LO 8** | Awareness of life-long learning; ability to reach information; follow developments in science and technology and continuous self-improvement. | |  |  |  |
| **LO 9** | Understanding of professional and ethical issues and taking responsibility | |  |  |  |
| **LO 10** | Awareness of project, risk and change management; awareness of entrepreneurship, innovativeness and sustainable development. | |  |  |  |
| **LO 11** | Knowledge of actual problems and effects of mechanical engineering applications on health, environment and security in global and social scale; an awareness of juridical results of engineering solutions. | |  |  |  |

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| **Prepared by :** | Prof. Dr. L. Berrin ERBAY | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MECHANICAL ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503702503 | **TITLE** | THERMOHYDRAULIC DESIGN II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | - | - | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 2 | | 30 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Thermohydraulic Analysis of cooling channels, Coolants, one and two phase Flows, Steam Generators Used In Nuclear Plants, Thermal – Hydraulics of Pressurized Water Reactors, Boiling Water Reactors, High Temperature Gas-Cooled Reactor, Liquid Metal Fast Breeder Reactors. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Teaching heat removal fundamentals and specifically the cooling systems of advance energy systems: nuclear reactors. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Designing coolant channels and effective cooling systems for advance energy plants. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Designing coolant channels and effective cooling systems for advance energy plants. | | | | | | | |
| **TEXTBOOK** | | | | | M.M.El-Wakil, Nuclear Heat Transport, American Nuclear Society, 0-89448-014-6, 1978. | | | | | | | |
| **OTHER REFERENCES** | | | | | Samuel Glastone ve Alexander Sesonske, Nuclear Reactor Engineering, Von Nostrand Reinhold Company, 1967. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Thermohydraulic Analysis of cooling channels |
| 3 | Coolants, one and two phase Flows |
| 4 | Steam Generators |
| 5 | Steam Generators Used In Nuclear Plants |
| 6 | Midterm Examination 1 |
| 7 | Pressurized Water Reactors and Water Reactor Thermal – Hydraulics |
| 8 | BWR-Boiling Water Reactors and Reactor Cooling channels and Thermal – Hydraulics |
| 9 | High Temperature Gas-Cooled Reactors |
| 10 | High Temperature Gas-Cooled Reactor Thermal – Hydraulics |
| 11 | Midterm Examination 2 |
| 12 | Liquid Metal Fast Breeder Reactors |
| 13 | Liquid Metal Fast Breeder Reactor Thermal – Hydraulics |
| 14 | Problems in Heat Removal and examles |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MECHANICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficient knowledge of mechanical engineering subjects related with science and own branch; an ability to apply theoretical and practical knowledge on solving and modeling of engineering problems. |  |  |  |
| **LO 2** | Ability to determine, define, formulate and solve complex mechanical engineering problems; for that purpose an ability to select and use convenient analytical and experimental methods. |  |  |  |
| **LO 3** | Ability to design a complex system, a component and/or an engineering process under real life constrains or conditions, defined by environmental, economical and political problems; for that purpose an ability to apply modern design methods. |  |  |  |
| **LO 4** | Ability to develop, select and use modern methods and tools required for mechanical engineering applications; ability to effective use of information technologies. |  |  |  |
| **LO 5** | In order to investigate mechanical engineering problems; ability to set up and conduct experiments and ability to analyze and interpretation of experimental results. |  |  |  |
| **LO 6** | Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence. |  |  |  |
| **LO 7** | Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language. |  |  |  |
| **LO 8** | Awareness of life-long learning; ability to reach information; follow developments in science and technology and continuous self-improvement. |  |  |  |
| **LO 9** | Understanding of professional and ethical issues and taking responsibility |  |  |  |
| **LO 10** | Awareness of project, risk and change management; awareness of entrepreneurship, innovativeness and sustainable development. |  |  |  |
| **LO 11** | Knowledge of actual problems and effects of mechanical engineering applications on health, environment and security in global and social scale; an awareness of juridical results of engineering solutions. |  |  |  |

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| **Prepared by :** | Prof. Dr. L. Berrin ERBAY | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | FUSELAGES |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 10 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | | 1 | | 60 |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | All the details to the design of aircraft. Presentation all the elements of the body, including on the plane. For example an aircraft design | | | | | | | |
| **COURSE OBJECTIVES** | | | | | • Introductio to fuselage  •"Aviation Sector In Practice" of these fuselages  • These applications, reflected technological developments in the civilian sector to recognize  • As an engineer, in the light of these developments, new designs and be able to interpret the current developments  • identify the sector of industrial facilities and opportunities to learn about the issues so that the lesson learned in the sector and establish the relationship between the tractor industry issues. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Through this course, because it is the fastest growing technology, aerospace, professional literature, is considered to be updated very often. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | A graduate student completing this course, on the fuselage of the aircraft's other structural parts of the motor on the minimum level of knowledge about the design of an adequate level, and becomes the owner of an aircraft.  In addition, in the event of work in the sector both in terms of business meetings as well as its knowledge in the workplace becomes more advantageous than other mechanical engineers | | | | | | | |
| **TEXTBOOK** | | | | | Uçak Tasarım Projeleri, LLYOD R., JENKINSON | | | | | | | |
| **OTHER REFERENCES** | | | | | Composite in Aerospace Applications, 2001 (Quilter A.)akhlouf | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The principle of the general structure of the aircraft and flight |
| 2 | Aircraft recognition |
| 3 | Aircraft wing and ailerons |
| 4 | Landing gear |
| 5 | Airframes |
| 6 | Midterm Examination 1 |
| 7 | Aircraft Design |
| 8 | Aircraft Design |
| 9 | Aircraft Design |
| 10 | Aircraft Design |
| 11 | Midterm Examination 2 |
| 12 | Engine Design |
| 13 | Engine Design |
| 14 | Engine Design |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Assoc.Prof.Dr. Melih Cemal Kuşhan | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | AVIATIONS MATERIALS |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 10 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | | 1 | | 60 |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | NDI in aviation, maintanencein aviation , RAM, armour materials, Pytotechnics and application of aviation , Frames of Aeroplanes | | | | | | | |
| **COURSE OBJECTIVES** | | | | | • Introductio to fuselage  •"Aviation Sector In Practice" of these fuselages  • These applications, reflected technological developments in the civilian sector to recognize  • As an engineer, in the light of these developments, new designs and be able to interpret the current developments  • identify the sector of industrial facilities and opportunities to learn about the issues so that the lesson learned in the sector and establish the relationship between the tractor industry issues. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Through this course, because it is the fastest growing technology, aerospace, professional literature, is considered to be updated very often | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The student knows the latest developments in aviation industry Technologies  • Information-age as an engineering requirement, access to information, sharing techniques and uses forward  • the aviation industry of our country learns  • learn the status of aviation-aerospace technologies in the world.  • Existing technologies developed and developing possible design for products develops | | | | | | | |
| **TEXTBOOK** | | | | | • Savunma Sanayi Malzemeleri Ders Notları, 2011 (Kuşhan M.C.)• Composite Materials for Aircraft Applications, 1998 (Deo R.B.)• A dan Z ye Dünya Uçakları ve Helikopterleri, 2006 (Kuşhan M.C.) | | | | | | | |
| **OTHER REFERENCES** | | | | | Composite in Aerospace Applications, 2001 (Quilter A.)akhlouf | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Genaral Aviation Materials and Classification |
| 2 | Metals as Aviation Materials |
| 3 | Ceramics as Aviation Materials |
| 4 | Composites as Aviation Materials |
| 5 | Plastics as Aviation Materials |
| 6 | Midterm Examination 1 |
| 7 | Radar Absorbtion Materials |
| 8 | Vehicle Armors |
| 9 | Ballistic Armors |
| 10 | Prrotechnic |
| 11 | Midterm Examination 2 |
| 12 | Study Presentation |
| 13 | Study Presentation |
| 14 | Study Presentation |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Assoc.Prof.Dr. Melih Cemal Kuşhan | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | AIRCRAFT FUSELAGE |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | English |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | 30 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 80 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 20 |
| **PREREQUISITE(S)** | | | | | ------ | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | • NDI in aviation, maintanencein aviation , RAM, armour materials, Pytotechnics and application of aviation , Frames of Aeroplanes | | | | | | | |
| **COURSE OBJECTIVES** | | | | | • Introductio to fuselage  •"Aviation Sector In Practice" of these fuselages  • These applications, reflected technolog  • As an engineer, in the light of these developments, new designs and be able to interpret the current developments  • identify the sector of industrial facilities and opportunities to learn about the issues so that the lesson learned in the sector and establish the relationship between the tractor industry issues. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Through this course, because it is the fastest growing technology, aerospace, professional literature, is considered to be updated very often. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | • The student knows the latest developments in aviation industry Technologies  • Information-age as an engineering requirement, access to information, sharing techniques and uses forward  • the aviation industry of our country learns  • learn the status of aviation-aerospace technologies in the world.  • Existing technologies developed and developing possible design for products develops | | | | | | | |
| **TEXTBOOK** | | | | | Uçak Tasarım Projeleri, LLYOD R., JENKINSON | | | | | | | |
| **OTHER REFERENCES** | | | | | • A’dan Z’ye Dünya Uçakları ve Helikopterleri, KUŞHAN M.C.• Recent Advantages in Aircraft Technology, AGARWAL K.• Uçaklar ve Helikopterler, ŞAHİN K.• Uçak Ana Elemanları, ÖZŞAHİN E.r | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The principle of the general structure of the aircraft and flight |
| 2 | Aircraft recognition |
| 3 | Aircraft wing and ailerons |
| 4 | Landing gear |
| 5 | Airframes |
| 6 | Midterm Examination 1 |
| 7 | Aircraft Design |
| 8 | Aircraft Design |
| 9 | Aircraft Design |
| 10 | Aircraft Design |
| 11 | Midterm Examination 2 |
| 12 | Presentation of Homeworks |
| 13 | Presentation of Homeworks |
| 14 | Presentation of Homeworks |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Doç. Dr. Melih Cemal Kuşhan | **Date:** | | Apr,25,2016 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Control Theory in Gas Turbine Engines |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | Non | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | History of Gas Turbines, Control Theory in Gas Turbine Engines, Related Systems, Modelling of Engine and an Example of Controller Design, Current Control Techniques | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to investigate the history of control techniques and to learn current control techniques of gas turbine engines in aerospace. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To get knowledge about;  1- Gas turbine engines,  2-History of gas turbine engine control tecniques and current techniques | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The students who take this course get comprehensive knowledge about gas turbine engines, its control techniques and design process. The requirements and necessary design limitations of developing a product in industrial or academic area are learnt. In that directon, they gain skill and experience about forming related system design conditions. | | | | | | | |
| **TEXTBOOK** | | | | | 1-Moir, I. ve Seabridge, A., Aircraft Systems, Mechanical, Electrical and Avionics Subsystems Integration, John Wiley & Sons, Inc., 2008.2-Jaw, L. C. ve Mattingly, J. D., Aircraft Engine Controls Design, System Analysis, and Health Monitoring (Ed:Schetz, J. A.), AIAA Education Series, Reston, Virginia, 2009. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1-Karakoç H.K. ve Turgut E.T., Gas Turbine Engine Systems, Anadolu University Publicaitons, ISBN 978-975-06-0534-5, 01/07/20082-Turkish Airlines, Jamf Egitim Dokumanlari | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Gas Turbine Engines |
| 2 | History of Gas Turbine Engine Control |
| 3 | Full Autorithy Digital Engine Control, Related Aircraft Systems and Components |
| 4 | Full Autorithy Digital Engine Control, Related Aircraft Systems and Components |
| 5 | Full Autorithy Digital Engine Control, Related Aircraft Systems and Components |
| 6 | Midterm Examination 1 |
| 7 | Full Autorithy Digital Engine Control, Related Aircraft Systems and Components |
| 8 | Full Autorithy Digital Engine Control, Related Aircraft Systems and Components |
| 9 | Mathematical Modelling of Gas Turbine Engine and an Example of Controller Design |
| 10 | Mathematical Modelling of Gas Turbine Engine and an Example of Controller Design |
| 11 | Midterm Examination 2 |
| 12 | Current Control Techniques |
| 13 | Current Control Techniques |
| 14 | Current Control Techniques |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Assist. Prof. Isil Yazar | **Date:** | | 12/04/2016 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | AEROSPACE AND AVIATION ERGONOMY |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  (   ) |  |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | 30 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | | 20 |
| Report | | | | |  | | 10 |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | General ergonomy designing termination in aerospace or aviatition | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Ergonmic terminations in aerospace engineering… | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | GENERAL PRİNCİPLES OF ERGONOMY , cognitive ergonomyresearch for an aeroplane cockpi in user friend 3 D modelling for pilots Ergonomy for engieers, Fatih BAAKI | | | | | | | |
| **TEXTBOOK** | | | | | Ergonomy for engieers, Fatih BABALIK | | | | | | | |
| **OTHER REFERENCES** | | | | | Ergonomy What,Why,HowJan Dul, B.Weertmester | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to ergonomy, history |
| 2 | Antropetry,Cognitive ergonomy, organizotional ergonomy and cognitive ergonomy |
| 3 | Phsicaı,chemical, biological, and psosocial risk factors |
| 4 | Antropometric problems in engineering, |
| 5 | " |
| 6 | Midterm Examination 1 |
| 7 | Project and homework in avaitation.ergonomy |
| 8 | Cognitive ergonomy terminology |
| 9 | Human factors engineering |
| 10 | visual,auditive and other cognition prosses |
| 11 | Midterm Examination 2 |
| 12 | Wurking places design for risk factors |
| 13 | Homework and project presentations. |
| 14 | Presentations and |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
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| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Dr. Mümtaz Slih ERDEM | **Date:** | | Apr,25,2016 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Wave Propagation in Solid Media |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 6 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | 1- 1-D waves - axial: wave eqn.; wave speed; d’Alembert solution  2- 1-D waves - axial:Particle velocity; initial value problem (IVP); boundary value problem (BVP)  3- 1D waves – axial: Wave reflection at free and fixed boundaries  4- 1D waves – axial: Acoustic impedance; wave propagation through interfaces  5- 1D waves – axial: Power and energy of generic waves  6- 1D waves – axial: Harmonic waves IVP and BVP  7- 1D waves – axial: Harmonic waves reflections; standing waves; power and energy of harmonic waves  8- 1D waves - flexural: Flexural wave equation; harmonic solution  9- 1D waves - flexural: Flexural waves dispersion; group velocity; energy velocity  10- 3D waves: 3D Elasticity review; Navier eqns.  11- 3D waves: Plane waves in 3D, pressure & shear waves  12- 3D waves: Wave potentials, z-invariant (plane strain) 3D waves  13- 1D/2D waves: Wave transmission and reception  14- 3D waves: SH waves; P+SV waves  15- 2D/3D waves: Wave propagation through bimaterial interface: transmission, reflection, mode conversion  16 Guided waves: SH guided waves, Lamb waves, Rayleigh waves | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The elastic waves that have widely been used in structural analyses can be generated in many forms by utilizing various methods. To learn the theory of elastic and acoustic waves generated and propagated in solids is of paramount importance in order to generate and utilize them in right manner. Therefore, by offering this course, teaching the aspects of the wave propagation methods and theories aims at having ability to conduct analyses in aerostructures, civil structures, and machinery parts in Master's degree level. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1- to teach the essence of the wave propagation theory  2- to teach the wave mode types in finite and infinite solid media  3- to teach the mathematical models of wave propagation in solids  4- to analyse the behavior of waves in structural analysis  5- to give the ability to conduct research ib topics related to wave propagation | | | | | | | |
| **TEXTBOOK** | | | | | Victor Giurgiutiu "Structural Health Monitoring with Piezoelectric Wafer Active Sensors" | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 | Midterm Examination 1 |
| 7 |  |
| 8 |  |
| 9 |  |
| 10 |  |
| 11 | Midterm Examination 2 |
| 12 |  |
| 13 |  |
| 14 |  |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | |  | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | Joint Course for the Institute | **SEMESTER** | Fall-Spring |

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| **COURSE** | | | |
| **CODE** | 501011101 | **TITLE** | The Scientific Research Methods and Its Ethics |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| MSc-  Ph.D | 3 | | 0 | 0 | | | 3+0 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 1,5 | | 1,5 | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Science, the scientific thought and other fundamental concepts, the scientific research process and its techniques, Methodology: Data Collecting-Analysis-Interpretation, Reporting the scientific research (Preparation of a thesis, oral presentation, article, project), Ethics, Ethics of scientific research and publication. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main objectives are: To examine the foundations of scientific research and the scientific research methods, to teach the principles of both the methodology and the ethics, to realize the process on a scientific research and to evaluate the results of research, to teach reporting the results of research (on a thesis, presentation, article). | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Applying the scientific research methods and the ethical rules in their professional life. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Gaining awareness on ethical principles at basic research methods, becoming skillful at analyzing and reporting the data obtained in scientific researches, being able to have researcher qualification with occupational sense of responsibility, having the scientific and vocational ethics’ understanding and being able to defend this understanding in every medium. | | | | | | | |
| **TEXTBOOK (Turkish)** | | | | | Karasar, N. (2015). Bilimsel Araştırma Yöntemi. Nobel Akademi Yayıncılık, Ankara. | | | | | | | |
| **OTHER REFERENCES** | | | | | **1-**Büyüköztürk, Ş., Çakmak, E. K., Akgün, Ö. E., Karadeniz, Ş., Demirel, F. (2012). Bilimsel Araştırma Yöntemleri. Pegem Akademi Yayınevi, Ankara.  **2-**Tanrıöğen, A. (Editör). (2014). Bilimsel Araştırma Yöntemleri. Anı Yayıncılık, Ankara.  **3-**Türkiye Bilimler Akademisi Bilim Etiği Komitesi. Bilimsel Araştırmada Etik ve Sorunları, Ankara: TÜBA Yayınları, (2002).  **4-**Ekiz, D. (2009). Bilimsel Araştırma Yöntemleri: Yaklaşım, Yöntem ve Teknikler. Anı Yayıncılık, Ankara.  **5-**Day, Robert A. (Çeviri: G. Aşkay Altay). (1996). Bilimsel Makale Nasıl Yazılır ve Nasıl Yayımlanır?, TÜBİTAK Yayınları, Ankara.  **6-**Özdamar, K. (2003). Modern Bilimsel Araştırma Yöntemleri. Kaan Kitabevi, Eskişehir.  **7-**Cebeci, S. (1997). Bilimsel Araştırma ve Yazma Teknikleri. Alfa Basım Yayım Dağıtım, İstanbul.  **8-**Wilson, E. B. (1990). An Introduction to Scientific Research. Dover Pub. Inc., New York.  **9-**Çömlekçi, N. (2001). Bilimsel Araştırma Yöntemi ve İstatistiksel Anlamlılık Sınamaları. Bilim Teknik Kitabevi, Eskişehir. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Science, scientific thought and other basic concepts (University, history of university, higher education, science, scientific thought and other related concepts) |
| 2 | Science, scientific thought and other basic concepts (University, history of university, higher education, science, scientific thought and other related concepts) |
| 3 | The scientific research and its types (Importance of the scientific research, types of science, scientific approach) |
| 4 | The scientific research process and its techniques (Access to the scientific knowledge, literature search, determining the research issue, definition of the problem, planning) |
| 5 | The scientific research process and its techniques (Access to the scientific knowledge, literature search, determining the research issue, definition of the problem, planning) |
| 6 | The scientific research process and its techniques (Access to the scientific knowledge, literature search, determining the research issue, definition of the problem, planning) |
| 7 | The method and the approach: Collecting, analysis and interpretation of the data (Data, data types, measurement and measurement tools, collecting data, organizing data, summarizing data, analysis and the interpretation of data) |
| 8 | The method and the approach: Collecting, analysis and interpretation of the data (Data, data types, measurement and measurement tools, collecting data, organizing data, summarizing data, analysis and the interpretation of data) |
| 9 | Finalizing the scientific research (Reporting, preparing the thesis, oral presentation, preparing an article and a project) |
| 10 | Finalizing the scientific research (Reporting, preparing the thesis, oral presentation, preparing an article and a project) |
| 11 | Finalizing the scientific research (Reporting, preparing the thesis, oral presentation, preparing an article and a project) |
| 12 | Ethics, scientific research and publication ethics (Ethics, rules of ethics, occupational ethics, non-ethical behaviors) |
| 13 | Ethics, scientific research and publication ethics (Ethics, rules of ethics, occupational ethics, non-ethical behaviors) |
| 14 | Ethics, scientific research and publication ethics (Ethics, rules of ethics, occupational ethics, non-ethical behaviors) |
| 15,16 | Mid-term exam, Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INSTITUTE’S GRADUATE PROGRAMME’S LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (M.Sc.-Ph.D.)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Having the scientific and vocational ethics’ understanding and being able to defend this understanding in every medium. | | |  | |  |  |
| **LO 2** | Being able to have researcher qualification with occupational sense of responsibility. | | |  | |  |  |
| **LO 3** | Becoming skillful at analyzing and reporting the data obtained in scientific researches. | | |  | |  |  |
| **LO 4** | Gaining awareness on ethical principles at basic research methods. | | |  | |  |  |
| **Prepared by :** | | |  | **Date:** | | 14.06.2016 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506702506 | **TITLE** | Mechanical and Electrical Integration of Aircraft Systems |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | Non | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction to Aircraft Systems, Flight Control Systems, Engine Control Systems, Fuel Systems, Hydraulic Systems, Electrical Systems, Pneumatic Systems, Environmental Control Systems, Emergency Systems, Rotary Wing Systems | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to learn components, missions and operation principles of entegrated systems in aircrafts. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To get knowledge about;  1-Aircraft Systems and their mechanical and electrical integration. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | .It is expected that this course will form a base about related subject to the students that works on aero vehicles or have plans to work on aero vehicles in industry or academy. | | | | | | | |
| **TEXTBOOK** | | | | | 1-Moir, I. ve Seabridge, A., Aircraft Systems, Mechanical, Electrical and Avionics Subsystems Integration, John Wiley & Sons, Inc., 2008.2-Jaw, L. C. ve Mattingly, J. D., Aircraft Engine Controls Design, System Analysis, and Health Monitoring (Ed:Schetz, J. A.), AIAA Education Series, Reston, Virginia, 2009. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1-Karakoç H.K. ve Turgut E.T., Gas Turbine Engine Systems, Anadolu University Publicaitons, ISBN 978-975-06-0534-5, 01/07/20082-Turkish Airlines, Jamf Egitim Dokumanlari | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Intoduction to Aircraft Systems |
| 2 | Flight Control Systems |
| 3 | Engine Control Systems |
| 4 | Fuel Systems |
| 5 | Fuel Systems |
| 6 | Midterm Examination 1 |
| 7 | Hydraulic Systems |
| 8 | Electrical Systems |
| 9 | Electrical Systems |
| 10 | Pneumatic Systems |
| 11 | Midterm Examination 2 |
| 12 | Environmental Control Systems |
| 13 | Emergency Systems |
| 14 | Rotary Wing Systems |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Assist. Prof. Isil Yazar | **Date:** | | 14/11/2016 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506702505 | **TITLE** | ADVANCED PRODUCTION TECHLOLOGIES IN AEROSPACE INDUSTRY |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | 30 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | | 20 |
| Report | | | | |  | | 10 |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Specific production technologies of the sector will be systematically explained by aircraft. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Ergonmic terminations in aerospace engineering… | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Multidisciplinary system students taking the course will have minimum knowledge about the subject | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | GENERAL PRİNCİPLES OF ERGONOMY , cognitive ergonomyresearch for an aeroplane cockpi in user friend 3 D modelling for pilots Ergonomy for engieers, Fatih BAAKI | | | | | | | |
| **TEXTBOOK** | | | | | Manufacturing prcess M. SCHEY | | | | | | | |
| **OTHER REFERENCES** | | | | | ----- | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Engine Production |
| 2 | GAS TURBINE MOTOR TECHNOLOGIES |
| 3 | GAS TURBINE ENGINE MATERIALS |
| 4 | METHODS OF GAS TURBINE PRODUCTION |
| 5 | TRADITIONAL PROCESSES |
| 6 | Midterm Examination 1 |
| 7 | SPECIAL PROCESSES |
| 8 | GAZ TÜRBİNİ ÜRETİMİNDE YÜZEY TEKNOLOJİLERİ |
| 9 | GAS TURBINE INSPECTION METHODS |
| 10 | BODY STRUCTURES AND PRODUCTION TECHNOLOGIES |
| 11 | Midterm Examination 2 |
| 12 | BODY CONSTRUCTION MATERIALS |
| 13 | PASSENGER COMFORT IN INTERIOR DESIGN AND TRADE AIRPLANES |
| 14 | BODY MOTOR AND LATEST ASSEMBLIES |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Dr. Mümtaz Slih ERDEM | **Date:** | | Nov.10.2016 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | HUMAN FACTORS ON AVIATION |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 0 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( X ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 1 | | 2 | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 2 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | -- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | ACCIDENTS ON AVIATION CAUSED BY HUMAN FACTORS, MANUFACTURING AND MRO PROBLEMS, DESCRIPTION OF ERROR PROOF SYSTEMS | | | | | | | |
| **COURSE OBJECTIVES** | | | | | PROFESSIONAL RESPONSIBILITY, AWARENESS, ETHIC, AVIATION CULTURE | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | IMPORTANCE OF HUMAN FACTORS ON AVIATION | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | PROFESSIONAL RESPONSIBILITY, AWARENESS, ETHIC, AVIATION CULTURE | | | | | | | |
| **TEXTBOOK** | | | | | -- | | | | | | | |
| **OTHER REFERENCES** | | | | | -- | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | ENTRANCE TO HUMAN FACTORS |
| 2 | AVIATION CULTURE AND AVIATION PSYCHOLOGY |
| 3 | UNDERSTANDING HUMAN FAULTS |
| 4 | AWARENESS |
| 5 | FLIGHT SAFETY |
| 6 | Midterm Examination 1 |
| 7 | HUMAN FACTORS ON MANUFACTURING |
| 8 | HUMAN FACTORS ON MANUFACTURING |
| 9 | HUMAN FACTORS ON MRO |
| 10 | HUMAN FACTORS ON MRO |
| 11 | Midterm Examination 2 |
| 12 | ACCIDENTS |
| 13 | ACCIDENTS |
| 14 | FUTURE OF HUMAN FACTORS |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | |  | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Introduction to Mini Drone Systems |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) |  |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 2 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | none | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Quadrator based mini drone sytems will be evaluated. Modelling and control methods will be analyzed by taking the quadrator system dynamics into account. Electrical quadrator system components are evaluated in details. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Introduction to drones, specially quadrators which are advancing in technology rapidly. Having detailed knowledge of mini drone structures. Having knowledge on quadrator system dynamics. Having detailed knowledge on electrical quadrator system components. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | It will contribute to the programme by giving comparative thinking and analysis techniques on mini aircraft structures which students can handle. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Having knowledge on drone components, their working principles and safety issues.  Having knowledge on building drones by assembling its individual off the shelve components.  Having avareness on factors for high performance drone systes.  Having ability for configuring and calibration of flight control boards.  Having knowledge on flight stabilization, flight quality and visulaization quality improvements.  Having knowledge on artificial intelligence and outonomous flight control applications and its importance. | | | | | | | |
| **TEXTBOOK** | | | | | DIY Drones for the Evil Genius: Design, Build, and Customize Your Own Drones, Ian Cinnamon. Building Your Own Drones, John Baichtal. | | | | | | | |
| **OTHER REFERENCES** | | | | | Technical documents or datasheets of quadrator components | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction, Drone Systems and Historical developments |
| 2 | Winged and wingless mini drone structures, application specific body selection |
| 3 | Certification and licensing issues |
| 4 | Propulsion systems, Electrical Speed Control Units |
| 5 | Importance of Aerodynamics, Importance of Vibration Reduction |
| 6 | Midterm Examination 1 |
| 7 | Batteries and Power Systems |
| 8 | Flight Control Units |
| 9 | Inertial Measurement Units (IMU), Inertial Balance, Accessory Sensing Units for Flight Assistance |
| 10 | Remote Control Systems, Telemetry, FPV ve Visualization Systems |
| 11 | Midterm Examination 2 |
| 12 | Sensor Based Autonomous Flights and Mapping |
| 13 | GPS and Outdoor Autonomous Flights |
| 14 | High Performance Flights and Special Requirements |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Yrd. Doç. Dr. Gökhan Dindiş | **Date:** | | 20-11-2017 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Flight Procedures and Airspace Design |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | |  |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 20 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Airspace design criteria and terminal airspace analysis; Instrument Flight Procedures, Standard Instrument Departure (SID), Standard Instrument Arrival Routes (STAR), Holding Pattern, Instrument Approach Procedures; Conventional and RNAV procedures; Minima calculations for the procedures; OCA/H for non-precision approach; OCA/H for precision approach; OCA/H for APV procedures. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | This course aims to acquire knowledge and skills to recognize and implement airspace design criteria related to flight procedures. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | This course will contribute to the participant in looking at aircraft operations from both aircraft and airspace perspectives. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The ability to comprehend flight procedures for safe flight operations,  The ability to assess terminal airspace flight maneuvers,  Analysis of standard instrument departure routes,  Analysis of arrival and approach routes. | | | | | | | |
| **TEXTBOOK** | | | | | ICAO Doc 8168 Procedure Approach for Air Navigation Services- AIRCRAFT OPERATIONS (PANS-OPS), Construction of Visual and Instrument Approach Procedures Vol-2, 2014 | | | | | | | |
| **OTHER REFERENCES** | | | | | - | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Airspace design criteria |
| 2 | Analysis of terminal manoeuvring area (TMA) |
| 3 | Instrument flight procedures |
| 4 | Standart instrument departure (SID) |
| 5 | Standart arrival routes (STAR) |
| 6 | Midterm Examination 1 |
| 7 | Halding pattern |
| 8 | Instrument approach procedures |
| 9 | Conventional and RNAV procedures |
| 10 | Minima calculations (OCA/H) |
| 11 | Midterm Examination 2 |
| 12 | OCA/H for non-precision approach |
| 13 | OCA/H for precision approach |
| 14 | OCA/H for APV procedures |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Assocate Professor Dr. Öznur USANMAZ | **Date:** | | 27.11.2017 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Advanced Thermodynamics of Aircraft Gas Turbine Engines |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 20 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Within the scope of this course, laws of thermodynamics, basic gas power cycles, parametric cycle analysis of gas turbine engines, parametric cycle, performance, conventional and advanced exergy analyses of gas turbine engines are covered. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To be able to understand fundamentals of propulsion systems as well analyze performance of any gas turbine engine using thermodynamics. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Comprehending fundamentals of gas power cycles, distinguishing gas turbine engine types, applying performance analyses of gas turbine engines using thermodynamics, evaluating performance of gas turbine engines. | | | | | | | |
| **TEXTBOOK** | | | | | Bejan A, Tsatsaronis G, Moran M., “Thermal design and optimization”, John Wiley & Sons, 1996.Mattingly, J.D., “Elements of Gas Turbine Propulsion”, McGraw-Hill, 1996. | | | | | | | |
| **OTHER REFERENCES** | | | | | Cengel, Y.A., Boles, M., "Thermodynamics: An Engineering Approach" (8th Ed.), McGraw-Hill, 2014.El-Sayed, A.F., “Aircraft Propulsion and Gas Turbine Engines”, CRC Press, 2008.Sohret Y. et al., “Advanced exergy analysis of an aircraft gas turbine engine: Splitting exergy destructions into parts”, Energy, 2015, 90: 1219-1228. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Ideal Gas Mixtures, First and Second Laws of Thermodynamics |
| 2 | Gas Power Cycles and Thermodynamic Analyses |
| 3 | Classification of Gas Turbine Engines, Parametric Cycle Analysis of Turbojet Engines |
| 4 | Parametric Cycle Analyses of Turbofan, Turboprop and Turboshaft Engines |
| 5 | Ideal Cycle Analyses of Turbojet, Turbofan, Turboprop and Turboshaft Engines |
| 6 | Midterm Examination 1 |
| 7 | Real Cycle Analyses of Turbojet, Turbofan, Turboprop and Turboshaft Engines |
| 8 | Performance Analyses of Turbojet and Turbofan Engines |
| 9 | Performance Analyses of Turboprop and Turboshaft Engines |
| 10 | Conventional Exergy Analysis of Turbojet Engines |
| 11 | Advanced Exergy Analysis of Turbojet Engines |
| 12 | Conventional Exergy Analysis of Turbofan Engines |
| 13 | Advanced Exergy Analysis of Turbofan Engines |
| 14 | Conventional and Advanced Exergy Analyses of Turboprop Engines |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Dr. Yasin ŞÖHRET | **Date:** | | 25.11.2017 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Additive Manufacturing |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 6 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 10 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Additive manufacturing technologies that have found a large area of applications in aerospace and defence industries, real part applications, suitable materials, process development, process monitoring and control, test and validation in Selective Laser Melting | | | | | | | |
| **COURSE OBJECTIVES** | | | | | the aim of this course is to create an awaress in the field of additive manufacturing which is considered as the manufacturing of the future and to provide a technical depth in the field. There is a high need of skilled and experienced staff in AM. Thanks to this course, a new road in becoming an expert in the field will be opened for student with an interest in AM technologies. In the course, applications from aerospace and defence will ve in focus detailing the sectoral requirements and expectations. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | In addition to fundamental additive manufacturing knowledge, this course will be based on sectoral experience to create an awareness. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Learning fundamentals of additive manufacturing technologies and working principles  2. Learning of applicability of ceramics, composites and polymer materials  3. Learning aerospace and defence applications in terms of requirements and limitations  4. Design for AM  5. Learning about process development, process monitoring and control in powder bed fusion processes. | | | | | | | |
| **TEXTBOOK** | | | | | Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital ManufacturingGibson, Ian, Rosen, David, Stucker, BrentISBN 978-1-4939-2113-3 | | | | | | | |
| **OTHER REFERENCES** | | | | | Will be defined in the course. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | What is additive manufacturing? Classification of AM technologies |
| 2 | AM for ceramics, polymers and composites |
| 3 | AM for metals |
| 4 | Applications of AM in defence and aerospace |
| 5 | Applications of AM in automotive, biomedical and die/mold |
| 6 | Midterm Examination 1 |
| 7 | Powder bed fusion AM techniques: Laser and Electron Beam Melting |
| 8 | Process Development |
| 9 | Material Characterization and Quality Control |
| 10 | Process Monitoring and Control |
| 11 | Midterm Examination 2 |
| 12 | Powder Production |
| 13 | Homework Presentations |
| 14 | Homework Presentation |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Evren Yasa | **Date:** | | 06.04.2018 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | FAILURE ANALYSIS IN AEROSPACE |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 1 | | 2 | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Description and objectives, general description and classification of failure analysis and as well as the analysis procedure sequence, the effective factors on failure of materials, the relationship with failure analysis and the materials itself, and the assessment of general requirements about the relationship among the materials and failure modes | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1. To introduce basic failure types and mechanisms observed in materials, 2. To introduce loading conditions leading failure and failure criteria, 3. To introduce failure detection and analysis methods, 4. To introduce failure prevention methods | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The attendees will learn how to adopt previous engineering background to solve failure of materials problems systematically, and work on case studies and reporting the failures properly | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Failure analysis methods and equipments 2. Identification of failures and steps of failure analysis, 3. Causes and mechanisms of failure in materials, 4. Failure types and characteristics, 5. Fracture analysis and fracture mechanics, 6. Identification of fatigue, wear, creep corrosion, welding, heat treatment and casting failures, 7. Failure mechanisms and analysis in composite materials, ceramics and glasses. | | | | | | | |
| **TEXTBOOK** | | | | | Daniel P. Dennies, How to Organize and Run a Failure Investigation ASM International Metals Park, Ohio, 2005 USA ISBN: 0-87170-811 | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Course scope, execution, evaluation definition of failure analysis, and classification |
| 2 | Understanding the failure |
| 3 | Probable causes of failure |
| 4 | Evaluating the likelihood of failures |
| 5 | The working environment effects on failure |
| 6 | Midterm Examination 1 |
| 7 | Fracture and fracture mechanics and relationship with the failure |
| 8 | Macroscopic investigation of fractures and fractography |
| 9 | Objectively and clearly identify failure |
| 10 | The corrective actions |
| 11 | Midterm Examination 2 |
| 12 | The effect of corrective actions |
| 13 | Case studies |
| 14 | Case studies and reporting the failures |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Asst.Prof.Dr.Bedri BAKSAN | **Date:** | | 30.03.2018 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Aircraft Design Parameters |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 30 |
| Report | | | | | 1 | | 20 |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | General Overview on Operational Analysis (OA). Survivability, Vulnerability and Susceptibility terms. OA engagement models, OA planning, design and application process. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach the fundamental concept and applications. To enhance the ability of analysis on defining OA requirements on for fighter aircraft parameters. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Construction of an fighter aircraft design with the subjects covered in the course within the framework of OA. Application of an OA model to a fighter aircraft. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Understand how the design parameters will be shaped within the framework of operational analysis of post-graduate students involved in the design of warplanes.  To have detailed knowledge of NATO member or non-member countries' warplanes and air defense systems.  To create the general framework of operational analysis by making the applications of the engagement models. | | | | | | | |
| **TEXTBOOK** | | | | | Robert E. Ball, The Fundamentals of Aircraft Combat Survivability Analysis and Design, Second Edition, AIAA, 2003. | | | | | | | |
| **OTHER REFERENCES** | | | | | Andrew G.Loerch, Larry B. Rainey, Methods for Conducting Military Operational Analysis, MORS, 2007. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | War-Gaming and Operational Analysis |
| 2 | Survivability Analysis of an Aircraft |
| 3 | The Relationship between Operational Analysis and Fighter Aircraf Design |
| 4 | Threat-Fighter Aircraft Relationship |
| 5 | Operating NATO member country aircraft |
| 6 | Midterm Examination 1 |
| 7 | Operation non-NATO member country aircraft |
| 8 | Air Defence System and modelling in the framework of Operational Analysis |
| 9 | Engagement Types |
| 10 | Tools developed for analysis of engagement types |
| 11 | Midterm Examination 2 |
| 12 | BVR Engagement Model |
| 13 | Penetration and Air to Ground Engagement Model |
| 14 | WVR Engagement Model |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Orhan Ertuğrul Güçlü, PhD | **Date:** | | 20/03/2018 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Flight Mechanics and Aircraft Perfoemance |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 0 | |  |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 40 |
| Quiz | | | | | 0 | | 0 |
| Homework | | | | | 2 | | 20 |
| Project | | | | | 0 | | 0 |
| Report | | | | | 0 | | 0 |
| Seminar | | | | | 0 | | 0 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Understandind the flight mechanics and aircraft performance, review of basic aerodynamics, learning of standard atmosphere features, derivation of take-off, climb, gliding, and range equations, derivation of best range equations, examination of longitudinal and lateral/directional stability issues. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Providing the flight mechanics and aircraft performance information to students who want to progress by doing academic or industrial R & D in the field of aviation | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Learning basic concepts of standart atmosphere, aircraft performance and flight mechanics, basic level of knowledge about aircraft stability and control issues | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students who take this course will have knowledge of the standard atmos- phere model. They will be able to analyze performance characteristics of an airplane. They will be able to comprehend static and dynamic stability characteristics of a plane by analyzing a given aircraft in the context of rigid body dynamics. They will improve their application skills on these subjects through practical homework. | | | | | | | |
| **TEXTBOOK** | | | | | Thomas R. Yechout, Introduction to Aircraft Flight Mechanics: Performance, Static Stability, Dynamic Stability, and Classical Feedback Control, AIAA Education Series, 2003 | | | | | | | |
| **OTHER REFERENCES** | | | | | Etkin B., Dynamics of Flight - Stability and Control, John Wiley & Sons, Inc., New York 1982.Nelson R.C., Flight Stability and Automatic Control, 2nd ed., McGraw-Hill, 1998. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Review of aerodynamics and fluid mechanics |
| 2 | Standard atmosphere, pressure, temperature and density altitudes |
| 3 | Basic airfoil properties |
| 4 | Lift and drag, drag polar |
| 5 | Air velocity, TAS, CAS, IAS, pitot-static tube, |
| 6 | Midterm Examination 1 |
| 7 | Introduction to aircraft performance, |
| 8 | Horizontal flight equations |
| 9 | Range and endurance equations |
| 10 | Climbing, descending equations |
| 11 | Midterm Examination 2 |
| 12 | Aircraft axis systems, equation of motion as a rigid body, |
| 13 | Aircraft force and moment equations, linearization |
| 14 | Introduction to static and dynamic stability and aircraft response |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Dr. Zafer ÖZNALBANT | **Date:** | | 21.03.2018 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Military Operational Analysis Modelling |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 20 |
| Report | | | | | 1 | | 20 |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | General Overview on Operational Analysis (OA). Survivability, Vulnerability and Susceptibility terms. OA methods and integrated analysis methods, Requirement Definition with OA. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach the fundamental concept and applications. To enhance the ability of analysis on defining OA requirements. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Capability Assessment and force structuring with strategic analysis with the subjects covered in the course within the framework of OA. Application of an OA model for requirement analysis. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Understand how the design parameters will be shaped within the framework of operational analysis of post-graduate students involved in the design of warplanes. | | | | | | | |
| **TEXTBOOK** | | | | | Robert E. Ball, The Fundamentals of Aircraft Combat Survivability Analysis and Design, Second Edition, AIAA, 2003. | | | | | | | |
| **OTHER REFERENCES** | | | | | Andrew G.Loerch, Larry B. Rainey, Methods for Conducting Military Operational Analysis, MORS, 2007. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to Operational Analysis |
| 2 | History of Operational Analysis |
| 3 | Decision Making and Analysis Process |
| 4 | Operational Analysis Methods |
| 5 | OA Usage Areas and Importance |
| 6 | Midterm Examination 1 |
| 7 | Definition of modelling requirements for OA |
| 8 | Modelling Framework Generation according to the OA |
| 9 | Defence Industry OA modelling pyramid |
| 10 | Constructive and virtual tools for engagement analysis |
| 11 | Midterm Examination 2 |
| 12 | Strategical level war gaming |
| 13 | Campaign level war gaming |
| 14 | War Gaming Exercise |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Orhan Ertuğrul Güçlü, PhD | **Date:** | | 20/03/2018 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** |  | **TITLE** | Air Vehicle Design and Optimization |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 40 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Review of Fundamentals of Air Vehicle Design  Systems Engineering Approach, Concept Generation and Selection, Interface Management, Verification and Validation, Optimization | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach the fundamental concept and applications of air vehicle design. To gain ability of approaching air vehicle design process with a systems engineering notion. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Knowledge of basic optimization concepts. Ability to design an air vehicle with a systems engineering notion. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Understanding of systems engineering approaches for the air vehicle design. Learning the place of optimization methods for the air vehicle design. | | | | | | | |
| **TEXTBOOK** | | | | | NASA Systems Engineering Handbook, NASA/SP-2007-6105 | | | | | | | |
| **OTHER REFERENCES** | | | | | Panos Y. Papalambros, Douglas J. Wilde, Principles of Optimal Design | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to Air Vehicle Design |
| 2 | Review of Air Vehicle Design Fundamentals |
| 3 | Review of Air Vehicle Design Fundamentals |
| 4 | Systems Engineering Approach to Air Vehicle Design |
| 5 | Requirements Management |
| 6 | Midterm Examination 1 |
| 7 | Concept Generation |
| 8 | Concept Selection |
| 9 | Interface Management |
| 10 | Verification and Validation |
| 11 | Midterm Examination 2 |
| 12 | Optimization |
| 13 | Optimization |
| 14 | Examples from Industry |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Ümit Kutluay, PhD | **Date:** | | 12/11/2018 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Finite Element Method and Applications in Aviation Industry |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | 2 | | | | 1 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 20 |
| Report | | | | | 1 | | 20 |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction to finite element method, Finite element formulations, One dimensional problems, Plane stress and strain, Axial symmetry in solids, 3D solids, FE applications in aircrafts, FE applications in aviation engines. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To introduce finite element method theory and its applications for structural problems, to understand mathematical models for basic structures and to derive their SE formulations, to gain know-how for applying the FE method to industrial problems for aviation and other industries. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Course helps the students for learning finite element method which is an emerging practice for aviation industry and engineering design and manufacturing processes. In this regard, it is beneficial for students for gaining the ability to work for research and development, as well as helping them for their career to be more competitive. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | -To gain knowledge for finite element method and relevant formulations.  -To gain knowledge for software tools used to solve finite element problems.  -To understand FE formulations for one dimensional, plane, axial symmetric and 3d problems.  -To analyze and synthesize engineering problems relevant to finite element method.  -To apply FE method for engineering practices especially in aviation  -To interpret and evaluate results obtained by FE method. | | | | | | | |
| **TEXTBOOK** | | | | | Reddy, J. N. (2006): An Introduction to the Finite Element Method, 3rd edition, McGraw Hill. | | | | | | | |
| **OTHER REFERENCES** | | | | | Demir, C. Makine Mühendisliği'nde sonlu Lemenalar Yöntemi, Yıldız Teknik Üniversitesi Ders Notları /Comsol, Multiphysics Cyclopedia, Mechanical Applications. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to finite element method |
| 2 | Finite element formulations |
| 3 | One dimensional problems |
| 4 | Trusses |
| 5 | Plane stress and strain |
| 6 | Midterm Examination 1 |
| 7 | Axial symmetrical solids |
| 8 | General 3D solids |
| 9 | Shell structures |
| 10 | Element types and their applications |
| 11 | Midterm Examination 2 |
| 12 | Sample FE application for aircraft structures |
| 13 | Sample FE application for aircraft engines |
| 14 | Sample FE application for aviation manufacturing processes |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Dr. Özgür Poyraz | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Performance of Aircraft |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 0 | |  |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | | 0 | | 0 |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 50 |
| Report | | | | |  | | 20 |
| Seminar | | | | | 0 | | 0 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Understandind the flight mechanics and aircraft performance, review of basic aerodynamics, learning of standard atmosphere features, derivation of take-off, climb, gliding, and range equations, derivation of best range equations, examination of longitudinal and lateral/directional stability issues. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | • Introductio to fuselage  •"Aviation Sector In Practice" of these fuselages  • These applications, reflected technolog  • As an engineer, in the light of these developments, new designs and be able to interpret the current developments  • identify the sector of industrial facilities and opportunities to learn about the issues so that the lesson learned in the sector and establish the relationship between the tractor industry issues. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | With this course, as the fastest developing technology is Defense Industry and aviation, the professional literature is handled very frequently. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. The student recognizes the latest developments in aviation industry technologies  2. Uses the techniques of reaching, sharing and communicating information as a requirement of an information age engineering  3. Learns the aviation industry of our country  4. Learn the state of aviation-space technologies in the world.  5. Develops design capability for products developed and developed with current technologies | | | | | | | |
| **TEXTBOOK** | | | | | Uçak Tasarım Projeleri, LLYOD R., JENKINSON | | | | | | | |
| **OTHER REFERENCES** | | | | | • Recent Advantages in Aircraft Technology, AGARWAL K. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Review of aerodynamics and fluid mechanics |
| 2 | Standard atmosphere, pressure, temperature and density altitudes |
| 3 | Basic airfoil properties |
| 4 | Lift and drag, drag polar |
| 5 | Air velocity, TAS, CAS, IAS, pitot-static tube, |
| 6 | Midterm Examination 1 |
| 7 | Introduction to aircraft performance, |
| 8 | Horizontal flight equations |
| 9 | Range and endurance equations |
| 10 | Climbing, descending equations |
| 11 | Midterm Examination 2 |
| 12 | Aircraft axis systems, equation of motion as a rigid body, |
| 13 | Aircraft force and moment equations, linearization |
| 14 | Introduction to static and dynamic stability and aircraft response |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr. Mustafa Cavcar | **Date:** | | 26.11.2018 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | PARTICLE IMAGE VELOCIMETRY ANALYSIS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 1 | | 2 | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 10 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 10 |
| Project | | | | | 1 | | 40 |
| Report | | | | | 1 | | 20 |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 20 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Analyzing the movements of flows in experimental environments | | | | | | | |
| **COURSE OBJECTIVES** | | | | | It's aim is to provide knowledge about fluid mechanics through experimental environment processes and to gain experimental skills | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To able to understand the behavior of the environment in which aerospace applications take place and the dynamic forms of other fluids. A predictive gain will be ensured for the fluid movements with experimental skills. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Information about the basic fluid movement forms and the experimental setup will be given.  Understanding the characteristics of the fluid movements will be ensured.  Experimental application of the flow around a structure at different speeds will be done.  The results obtained after the study will be analyzed in computer environment.  The results will be evaluated and presented as a report. | | | | | | | |
| **TEXTBOOK** | | | | | Raffel, M., Willert, C. E., Scarano, F., Kähler, C. J., Wereley, S. T., & Kompenhans, J. (2018). Particle image velocimetry: a practical guide. Springer. | | | | | | | |
| **OTHER REFERENCES** | | | | | Willert, C. E., & Gharib, M. (1991). Digital particle image velocimetry. Experiments in fluids, 10(4), 181-193. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic Fluid Mechanics Theory |
| 2 | PIV theoretical training |
| 3 | Introduction of equipment |
| 4 | Equipment safety |
| 5 | Laser usage instructions |
| 6 | Midterm Examination 1 |
| 7 | Basic camera information |
| 8 | PIV experiment workflow |
| 9 | Example PIV study |
| 10 | Image analysis with DynamicStudio |
| 11 | Midterm Examination 2 |
| 12 | Post Processing operations |
| 13 | Processing of test data |
| 14 | Discussion of the experimental results |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | |  | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | SUPERALLOYS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | NONE | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Physical and mechanical metallurgy of superalloys will be discussed together with the types. Properties and the effects of processes on properties will be highlighted. Finishing processes such as machining and joining will be explained. Case studies will be conducted for material selection and design. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Physical and mechanical metallurgy of superalloys will be discussed together with the types. Properties and the effects of processes on properties will be highlighted. Finishing processes such as machining and joining will be explained. Case studies will be conducted for material selection and design. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Course will contribute to the professional development of attendies with an in depth knowledge on material science subjects for aviation components that require high level engineering. With the gained knowledge of attendies on superalloy subjects, they will be able to take part in academical research projects and they also will be preferable engineers for avation industry companies. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1-Knowledge on superalloy types and strengthining mechanisms  2-Evaluation of superalloy properties through mechanical and enviromental factors  3-Understanding the effect of primary and finishing processes to the final properties of superalloys  4-Application of superalloy material selection criteria for the defined case studies | | | | | | | |
| **TEXTBOOK** | | | | | Donachie, M. J., & Donachie, S. J. (2002). Superalloys: a technical guide. ASM international. | | | | | | | |
| **OTHER REFERENCES** | | | | | Reed, R. C. (2008). The superalloys: fundamentals and applications. Cambridge university press. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction and historical development of superalloys |
| 2 | Types of superalloys according to chemical compositions |
| 3 | Mechanical properties of superalloys |
| 4 | Enviromental properties of superalloys |
| 5 | Pysical metallurgy of superalloys |
| 6 | Ingot metallurgy |
| 7 | Powder metallurgy |
| 8 | Wrought processing |
| 9 | Conventional and non-conventional machining of superalloys |
| 10 | Joining and welding of superalloys |
| 11 | Coatings for superalloys |
| 12 | Material selection for superalloys |
| 13 | Alternative materials |
| 14 | Applications and case studies |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Dr. Özgür Poyraz | **Date:** | | 15.04.2019 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** |  | **TITLE** | Aircraft Performance and Operational Analysis |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | |  |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 30 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Equation of motion, Level flight performance, Climb flight performance, Descent flight performance, Take-off and Landing performance, Turning flight performance, Operational analysis for every stage of mission profile, As an application aircraft trajectory calculation for a generic aircraft. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Be able to calculate turbojet/fan aircraft performance (climb, level flight, descent, take-off and landing and turning) for steady and accelerated flights | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Aeroplane is main component of aviation industry. Aircraft performance and operational limitation knowledge is very important for all aviation scientists especially air transportation and aircraft design subjects. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | learn the influence of atmosphere, aircraft weight and aircraft configuration on aircraft performance, calculate fuel consumption, range and endurance, rate of climb, rate of descent of an aircraft, calculate take-off and landing distances, calculate and analyze Airspeed-Drag curve,learn aircraft performance limitations such as airspeed, load factor. | | | | | | | |
| **TEXTBOOK** | | | | | \*Aydan Cavcar, Mustafa Cavcar, Uçuş Prensipleri, Anadolu Üniversitesi Yayınları, No.1085\* Francis Hale, Introduction of Aircraft Performance Selection and Design\* John D.Anderson, Aircraft Performance and Design\* Airbus Industry, Getting to Grips with Aircraft Performance\* Antonio Flippone, Flight Performance of Fixed and Rotary Wing Aircraft | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Definitions: Aircraft mission profiles, ICAO Standard Atmosphere, Weights, Speeds, Equations of Motion and Coordinate Systems |
| 2 | Aircraft Forces: Aerodynamic Forces |
| 3 | Aircraft Forces: Propulsion Forces |
| 4 | Aircraft Forces: Load Factor |
| 5 | Introduction of aircraft trajectory application, Level Flight: Range and Endurance |
| 6 | Midterm Examination 1 |
| 7 | Climbing Flight: ROC and climb speed calculation in steepest climb, fastest climb and most-economical climb, Ceiling conditions. |
| 8 | Application climb performance calculation for a generic aircraft |
| 9 | Descending Flight: ROD and descent speed calculation in best range and maximum endurance conditions. |
| 10 | Application descent flight performance calculation for a generic aircraft |
| 11 | Midterm Examination 2 |
| 12 | Turning Flight: Calculation of maximum load factor, maximum bank angle, maximum turning rate, and maximum turning radius. |
| 13 | Take-off and Landing: Calculation of take-off distance and landing distance and application |
| 14 | Airline Direct Operational Costs and CI concept |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr.Aydan CAVCAR (emekli öğr.üyesi) | **Date:** | | 2019, March 18 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** | Fall |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Turbofan Engine Systems |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (****)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | | **Evaluation Type** | | | | **Number** | | **Contribution ( % )** |
| Midterm | | | | 1 | | 30 |
| Quiz | | | |  | |  |
| Homework | | | | 1 | | 30 |
| Project | | | |  | |  |
| Report | | | |  | |  |
| Seminar | | | |  | |  |
| Other ( ) | | | |  | |  |
| **Final Examination** | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | | The basic engine by itself is not operable and cannot serve all the functions the airframe depends on. Additionally to its main components the basic engine needs various systems to become an operable engine. | | | | | | |
| **SHORT COURSE CONTENT** | | | | | | The history of gas turbine engines; Engine types: Turbojets, Turbofans, Turboshafts; Turboprops; Drive systems, Thermodynamic cycle | | | | | | |
| **COURSE OBJECTIVES** | | | | | | it is the intention of this course to give an  introduction to the systems of modern civil turbofan engines. These demonstrate  a significant change compared to respective older designs. The introduction to the systems will be given by investigating the systems of  some of the current generation of turbofan engines powering the present generation of large commercial transport aircraft. As these systems proved to be very successful, their design principles have also been adopted in the newest generation of smaller turbofan engines used in regional and business aircraft. | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | | It gives the studendts with the knowledge of  the mechanical as well as aerodynamic and thermodynamic aspects of turbofan engine designs. | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | | Describe the major assemblies of a turbofan engine. Explain compressor stall  Describe the EEC functions  Compare VBV, VSV and TVB on different engines Explain autostart and manual start  Describe the switches related to engine systems. Explain TBV system | | | | | | |
| **TEXTBOOK** | | | | | | Systems of Commercial Turbofan Engines | | | | | | |
| **OTHER REFERENCES** | | | | | Aircraft Engines and Gas Turbines | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Fundamentals of Gas Turbine Engines; The history of gas turbine engines; Engine types: Turbojets, Turbofans, Turboshafts; Turboprops; Drive systems, Thermodynamic cycle |
| 2 | The operational principles; Main assembles; Single, twin and triple spools concept; Thrust; SFC; Engine efficiencies; Pressure, temperature and velocity of the gas flow; Thermal, Propulsive and Overall Efficiencies; By-pass ratios; Factors affecting performance of gas turbine engines; Water injection; Afterburner |
| 3 | The operational principles; Main assembles; Single, twin and triple spools concept; Thrust; SFC; Engine efficiencies; Pressure, temperature and velocity of the gas flow; Thermal, Propulsive and Overall Efficiencies; By-pass ratios; Factors affecting performance of gas turbine engines; Water injection; Afterburner |
| 4 | Starting system; Operation principles; System components; Auto start, Manual start, Motoring; Frequently seen start system malfunctions |
| 5 | Ignition system; Operation principles; System components; Safety requirements |
| 6 | Lubricants and Fuel; Mineral and Synthetic Lubricants; Type I, II and III lubricants; Oil consumption of known aircraft |
| 7 | Lubricating systems; System components; Supply, Scavenge and Vent Systems; Dry sump, Wet sump; Constant pressure system; Full flow systems; |
| 8 | Engine internal air system; Operational principles; System components; Compressor flow control systems: VSV; VBV; Transient Bleed Valves; |
| 9 | Engine internal air system; Turbine Active Clearance Control Systems; Anti-ice systems; Cooling systems |
| 10 | Fuel systems: Fuel distribution systems; System components; Fuel metering principles |
| 11 | Fuel systems: Hydromechanical Fuel Control Units; Governing, Limiting and Metering Sections; Constant speed control; Constant thrust control; FADEC system |
| 12 | Engine Indication System; Engine performance indicators; Torquemeter; |
| 13 | N1; EPR; Engine system indicators; Oil temperature, |
| 14 | Pressure, quantity indicators; Fuel flow, EGT, Vibration indicator; |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and  use the information obtained. |  |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from  different disciplines in the framework of nanoscience and nanotechnology. |  |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency  of interdependence. |  |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel  strategic approaches. |  |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or  processes and to come up with innovative/alternative solutions. |  |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self  improvement. |  |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. |  |  |  |
| **LO 8** | Ability of effective usage of the information technologies. |  |  |  |
| **LO 9** | Understanding of professional and ethical issues. |  |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project  management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. |  |  |  |

**Prepared by :** Prof Onder TURAN **Date:** March, 22, 2022

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Airport System and Design |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | - | - | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | There is no prerequisite or co-requisite for this course. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Within the scope of the course, the minimum requirements and design criteria that the airport must meet as a system will be mentioned. Airport system and master planning, airport location selection, the effect of aircraft characteristics on airport design, airport capacity, airport elements and layout, airside geometric design, terminal area design, new formations related to the future of airports and air transport, runway coating types and airport lighting and Information about the marks will be given. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To convey technical and academic information about airports. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students taking the course will receive priority when they apply for a job as technical staff at airports. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1- Will be able to explain the planning types and what kind of planning techniques are used in airport design.  2- Will be able to explain airport elements and functions.  3- Will be able to list the stages of airport location selection.  4- Will be able to evaluate new approaches and trends in airport design. | | | | | | | |
| **TEXTBOOK** | | | | | Neufville, R. D., Odoni, A. R., Belobaba, P. P., & Reynolds, T. G. (2013). Airport systems: Planning, design and management. New York: McGraw Hill Education. | | | | | | | |
| **OTHER REFERENCES** | | | | | Caves, R. E., & Kazda, A. (2015). Airport design and operation. Emerald Group Publishing Limit. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Airport Concept and System |
| 2 | Airport classification and certification |
| 3 | Airport landside and airside |
| 4 | Airport System and Master Planning |
| 5 | Airport site selection |
| 6 | Effects of aircraft caracteristics on airport |
| 7 | Airport capacity |
| 8 | Airport configuration |
| 9 | Geometric design of airside |
| 10 | Design of the terminal area |
| 11 | Runway pavement |
| 12 | Airport lighting and signing |
| 13 | Example airports from Turkey and the world; Current studies on the airport |
| 14 | Example airports from Turkey and the world; Current studies on the airport |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Dr. Haşim KAFALI | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Exergoeconomic analysis of gas turbine engines |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Gas turbine engine types, gas turbine engine elements, energy, exergy and exergy-economic analysis of engine and sub-components, engine performance parameters and evaluation. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to learn the energy, exergy and exergy-economic analysis and performance evaluation of gas turbine engines and subsystems used in the aviation industry. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Course contributes the following information to students  1-Gas turbine engine types, 2-Sub-main systems of gas turbine engines  3-How to make energy, exergy and exergy economic analyzes and valuation of performance parameters of gas turbine engines. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students taking this course;   1. Learn gas turbine engine types, usage areas of engines and subsystems of engines. 2. Will be able to comprehend how thermodynamic and thermoeconomic analysis of gas turbine engines and engine sub-main components are done. 3. Will gain the knowledge and skills to evaluate the performance of a gas turbine aircraft engine by applying the methods learned. 4. Will be able to compare and synthesize different engine types. (5) Will be able to present new design proposals by evaluating the performance parameters. | | | | | | | |
| **TEXTBOOK** | | | | | 1. Ahmed F. El-Sayed. Fundamentals of Aircraft and Rocket Propulsion. Springer,1st ed. 2016 Edition 2.Adrian Bejan, George Tsatsaronis, Michael Moran - Thermal Design And Optimization (1995, John Wiley & Sons).pdf | | | | | | | |
| **OTHER REFERENCES** | | | | | Ibrahim Dincer Marc Rosen. Exergy:Energy, Environment and Sustainable Development.Elsevier, ISBN: 9780080970899, 2nd Edition. 2012 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | History of gas turbine engines, engine types and usage areas |
| 2 | Main components and and their tasks of gas turbine engines |
| 3 | Mass and energy conversion laws for gas turbine engine |
| 4 | Exergy balance equations laws for gas turbine engine |
| 5 | Energetic and exergetic performance parameters for gas turbine engine |
| 6 | Midterm Examination 1 |
| 7 | Economic analysis |
| 8 | Exergoeconomic analysis |
| 9 | Exergoeconomic performance metrics |
| 10 | Exergoeconomic analysis modeling of gas turbine engine |
| 11 | Homework |
| 12 | An application for turbojet engines |
| 13 | An application for turboprop engines |
| 14 | An application for turbofan engines |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGYMSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | Assoc.Prof.Dr. Özgür BALLI | **Date:** | |  | | | |

**Signature**:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** | Spring |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Hybrid Propulsion Systems and Aviation Applications |

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| **LEVEL** | **HOUR/WEEK** | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | |
| **MSc** | 3 | | 0 | 0 | | 3 | 4.5 | COMPULSORY  ( ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with ( )]** | | | | | | |
|  | | x | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | 1 | | 30 |
| Quiz | | | |  | |  |
| Homework | | | | 1 | | 30 |
| Project | | | |  | |  |
| Report | | | |  | |  |
| Seminar | | | |  | |  |
| Other ( ) | | | |  | |  |
| **Final Examination** | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | -. | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Electric propulsion systems, hybrid propulsion systems, types, connection types of hybrid propulsion systems, application areas, aviation applications, application in UAVs | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to give information about the working principles of  hybrid systems, their necessity in terms of use, working principles and aviation applications. | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Due to the gradual decrease of fossil fuels, their negative effects on the  environment and their increasing costs, the use of internal combustion engines in aviation is reduced, the use of hybrid systems is on the agenda instead, and information about this new technology will be obtained. | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Explain why hybrid propulsion systems are needed and their importance.  Defines hybrid propulsion system types.  Defines hybrid propulsion system connection types. Learns about common applications.  Learns about applications in aircraft.  Gains knowledge about applications in UAVs. | | | | | | |
| **TEXTBOOK** | | | | | - | | | | | | |
| **OTHER REFERENCES** | | | | | - | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Overview of aircraft propulsion systems |
| 2 | Electric propulsion systems, advantages and disadvantages, future predictions |
| 3 | Types of electric vehicles |
| 4 | Definition, importance, development, advantages and disadvantages of hybrid propulsion systems |
| 5 | Types of hybrid propulsion systems |
| 6 | Comparison of electric propulsion and hybrid propulsion vehicles |
| 7 | Hybrid propulsion systems connection variants |
| 8 | Hybrid propulsion systems connection types, hybridization |
| 9 | Energy storage in hybrid propulsion systems |
| 10 | Fuel cells |
| 11 | Use and importance of solar and wind energy |
| 12 | General application areas of hybrid systems |
| 13 | Hybrid system application examples in aircraft |
| 14 | Hybrid system usage and application examples in UAVs |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION**  **SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION**  **LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a  scientific manner in depth and in width as well as to access, interpret and use the information obtained. |  |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from  different disciplines in the framework of nanoscience and nanotechnology. |  |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency  of interdependence. |  |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel  strategic approaches. |  |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or  processes and to come up with innovative/alternative solutions. |  |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow  developments in science and technology and continuous self improvement. |  |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. |  |  |  |
| **LO 8** | Ability of effective usage of the information technologies. |  |  |  |
| **LO 9** | Understanding of professional and ethical issues. |  |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness  of limitations that such factors impose on the practices. |  |  |  |

**Prepared by :**  **Date:** November, 04, 2022

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | HUMAN FACTORS ON AVIATION |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 0 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( X ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 1 | | 2 | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 2 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | -- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | ACCIDENTS ON AVIATION CAUSED BY HUMAN FACTORS, MANUFACTURING AND MRO PROBLEMS, DESCRIPTION OF ERROR PROOF SYSTEMS | | | | | | | |
| **COURSE OBJECTIVES** | | | | | PROFESSIONAL RESPONSIBILITY, AWARENESS, ETHIC, AVIATION CULTURE | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | IMPORTANCE OF HUMAN FACTORS ON AVIATION | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | PROFESSIONAL RESPONSIBILITY, AWARENESS, ETHIC, AVIATION CULTURE | | | | | | | |
| **TEXTBOOK** | | | | | -- | | | | | | | |
| **OTHER REFERENCES** | | | | | -- | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | ENTRANCE TO HUMAN FACTORS |
| 2 | AVIATION CULTURE AND AVIATION PSYCHOLOGY |
| 3 | UNDERSTANDING HUMAN FAULTS |
| 4 | AWARENESS |
| 5 | FLIGHT SAFETY |
| 6 | Midterm Examination 1 |
| 7 | HUMAN FACTORS ON MANUFACTURING |
| 8 | HUMAN FACTORS ON MANUFACTURING |
| 9 | HUMAN FACTORS ON MRO |
| 10 | HUMAN FACTORS ON MRO |
| 11 | Midterm Examination 2 |
| 12 | ACCIDENTS |
| 13 | ACCIDENTS |
| 14 | FUTURE OF HUMAN FACTORS |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | |  | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AVIATION SCIENCE AND TECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506702509 | **TITLE** | ADVANCED THERMODYNAMICS OF AIRCRAFT GAS TURBINE ENGINES |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 20 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Within the scope of this course, laws of thermodynamics, basic gas power cycles, parametric cycle analysis of gas turbine engines, parametric cycle, performance, conventional and advanced exergy analyses of gas turbine engines are covered. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To be able to understand fundamentals of propulsion systems as well analyze performance of any gas turbine engine using thermodynamics. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Comprehending fundamentals of gas power cycles, distinguishing gas turbine engine types, applying performance analyses of gas turbine engines using thermodynamics, evaluating performance of gas turbine engines. | | | | | | | |
| **TEXTBOOK** | | | | | Bejan A, Tsatsaronis G, Moran M., “Thermal design and optimization”, John Wiley & Sons, 1996.Mattingly, J.D., “Elements of Gas Turbine Propulsion”, McGraw-Hill, 1996. | | | | | | | |
| **OTHER REFERENCES** | | | | | Cengel, Y.A., Boles, M., "Thermodynamics: An Engineering Approach" (8th Ed.), McGraw-Hill, 2014.El-Sayed, A.F., “Aircraft Propulsion and Gas Turbine Engines”, CRC Press, 2008.Sohret Y. et al., “Advanced exergy analysis of an aircraft gas turbine engine: Splitting exergy destructions into parts”, Energy, 2015, 90: 1219-1228. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Ideal Gas Mixtures, First and Second Laws of Thermodynamics |
| 2 | Gas Power Cycles and Thermodynamic Analyses |
| 3 | Classification of Gas Turbine Engines, Parametric Cycle Analysis of Turbojet Engines |
| 4 | Parametric Cycle Analyses of Turbofan, Turboprop and Turboshaft Engines |
| 5 | Ideal Cycle Analyses of Turbojet, Turbofan, Turboprop and Turboshaft Engines |
| 6 | Midterm Examination 1 |
| 7 | Real Cycle Analyses of Turbojet, Turbofan, Turboprop and Turboshaft Engines |
| 8 | Performance Analyses of Turbojet and Turbofan Engines |
| 9 | Performance Analyses of Turboprop and Turboshaft Engines |
| 10 | Conventional Exergy Analysis of Turbojet Engines |
| 11 | Advanced Exergy Analysis of Turbojet Engines |
| 12 | Conventional Exergy Analysis of Turbofan Engines |
| 13 | Advanced Exergy Analysis of Turbofan Engines |
| 14 | Conventional and Advanced Exergy Analyses of Turboprop Engines |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AVIATION SCIENCE AND TECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to access information in Aviation Science and Technologies in a scientific manner in depth and in width as well as to access, interpret and use the information obtained. | | |  | |  |  |
| **LO 2** | The synthesizing ability of the different information gathered from different disciplines in the framework of nanoscience and nanotechnology. | | |  | |  |  |
| **LO 3** | Ability to work effectively in inter or multi-disciplinary teams, proficiency of interdependence. | | |  | |  |  |
| **LO 4** | Designing ability of the complex system, process equipment or product under the realistic constraints and conditions by developing the novel strategic approaches. | | |  | |  |  |
| **LO 5** | Ability to develop new or original ideas to design complex systems or processes and to come up with innovative/alternative solutions. | | |  | |  |  |
| **LO 6** | Awareness of life-long learning ability to reach information follow developments in science and technology and continuous self improvement. | | |  | |  |  |
| **LO 7** | Ability to communicate in written and oral forms in a foreign language. | | |  | |  |  |
| **LO 8** | Ability of effective usage of the information technologies. | | |  | |  |  |
| **LO 9** | Understanding of professional and ethical issues. | | |  | |  |  |
| **LO 10** | Knowledge of social, environmental, health, safety and judicial dimensions of Aviation Science and Technologies applications, knowledge of project management and workplace practices in the field as well as the awareness of limitations that such factors impose on the practices. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Dr. Yasin ŞÖHRET | **Date:** | | 25.11.2017 | | | |

**Signature**: