# AYDIN ADNAN MENDERES UNIVERSITY
# COURSE INFORMATION FORM

| Course Title | | Advanced Dynamics | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | | MME533 | | Couse Level | | Second Cycle (Master's Degree) | | | |
| ECTS Credit | 8 | Workload | 200 *(Hours)* | Theory | 3 | Practice | 0 | Laboratory | 0 |
| Objectives of the Course | | To give the necessary mechanical principles and concepts for the dynamic analysis of finite degree of freedom systems and to teach to obtain equations of motion governing of mechanical systems | | | | | | | |
| Course Content | | Mechanical principles of Mechanical Systems Dynamics. Lagrange Equations. Hamilton Principle. Hamilton Canonical Equations. | | | | | | | |
| Work Placement | | N/A | | | | | | | |
| Planned Learning Activities and Teaching Methods | | | | Explanation (Presentation), Discussion, Individual Study | | | | | |
| Name of Lecturer(s) | | | | | | | | | |

## Assessment Methods and Criteria

| Method | Quantity | Percentage (%) |
|---|---|---|
| Midterm Examination | 1 | 40 |
| Final Examination | 1 | 60 |

## Recommended or Required Reading

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|---|---|
| 1 | L.Meirovitch : "Methods of Analytical Dynamics", New-York, McGraw-Hill, 1970. |
| 2 | D.T.Greenwood : "Principles of Dynamics", Sec.Ed., New Jersey, Prentice-Hall, 1988. |
| 3 | G.R. Fowles / G.L.Cassiday : " Analytical Mechanics", 6th Ed. Fort Worth ,Saunders College Publishing,1999. |
| 4 | M. Gürgöze, "Analitik Mekaniğe Giriş", İTÜ Vakfı Yayınları, 2019 |

| Week | Weekly Detailed Course Contents | |
|---|---|---|
| 1 | Theoretical | Mechanical Principles: Genell. Coordination, Degree of Freedom, Bonds, Forces, Systems |
| 2 | Theoretical | Mechanical Principles: Principle of Virtual Works, D'Alembert Principle, |
| 3 | Theoretical | Mechanical Principles: Lagrange's Principle |
| 4 | Theoretical | Lagrange Equations: Deriving, Potential Function, Conservative Systems |
| 5 | Theoretical | Lagrange Equations: Examples, Bond Forces |
| 6 | Theoretical | Problem Solutions |
| 7 | Theoretical | Problem Solutions |
| 8 | Intermediate Exam | Midterm |
| 9 | Theoretical | Hamilton Principle: Principles of Variation Calculation |
| 10 | Theoretical | Principles of Variation Calculation |
| 11 | Theoretical | Hamilton Principle: Deriving Hamilton Principle from Lagrange Principle, Deriving Lagrange Equations from Hamilton Principle |
| 12 | Theoretical | Hamilton Principle: Application examples |
| 13 | Theoretical | Ham. Canonical Equations |
| 14 | Theoretical | Problem solutions |
| 15 | Theoretical | Problem solutions |
| 16 | Final Exam | Final Exam |

## Workload Calculation

| Activity | Quantity | Preparation | Duration | Total Workload |
|---|---|---|---|---|
| Lecture - Theory | 14 | 6 | 3 | 126 |
| Assignment | 7 | 3 | 1 | 28 |
| Midterm Examination | 1 | 20 | 3 | 23 |

| Final Examination | 1 | 20 | 3 | 23 |
|---|---|---|---|---|
| | | | Total Workload (Hours) | 200 |
| | | [Total Workload (Hours) / 25*] = **ECTS** | | 8 |

*\*25 hour workload is accepted as 1 ECTS*

## Learning Outcomes

| | |
|---|---|
| 1 | Learning the basic concepts of mechanical principles |
| 2 | To be able to obtain equations of motion of finite degree of freedom systems |
| 3 | Perform dynamic analysis for finite degree of freedom systems |
| 4 | To be able to calculate bond forces in mechanical systems |
| 5 | To gain skills on nodeling and dynamic analysis for real systems |

## Programme Outcomes *(Mechanical Engineering (English) Master)*

| | |
|---|---|
| 1 | To be able to access wide and deep information with scientific researches in the field of Engineering, evaluate, interpret and implement the knowledge gained in his/her field of study |
| 2 | To be able to complete and implement "limited or incomplete data" by using the scientific methods |
| 3 | To be able to consolidate engineering problems, develop proper method(s) to solve and apply the innovative solutions to them |
| 4 | To be able to develop new and original ideas and method(s), to develop new innovative solutions at design of system, component or process |
| 5 | To be able to gain comprehensive information on modern techniques, methods and their borders which are being applied to engineering |
| 6 | To be able to design and apply analytical, modeling and experimental based research, analyze and interpret the faced complex issues during the design and apply process |
| 7 | To be able to gain high level ability to define the required information and data |
| 8 | To be able to work in multi-disciplinary teams and to take responsibility to define approaches for complex situations |
| 9 | To be able to transfer of the process and results of studies at national and international environments systematic and clear verbal or written |
| 10 | To be able to be aware of social, scientific and ethical values guarding adequacy at all professional activities and at the stage of data collection, interpretation, and announcement |
| 11 | To be able to become aware of new and developing application of profession and ability to analyze and study on those applications |
| 12 | To be able to interpret engineering application's social and environmental dimensions and it's compliance with the social environment |

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

| | L1 | L2 | L3 | L4 | L5 |
|---|---|---|---|---|---|
| P1 | 4 | 5 | 3 | 5 | 5 |
| P2 | 5 | 4 | 4 | 4 | 4 |
| P3 | 4 | 4 | 5 | 4 | 4 |
| P4 | 4 | 3 | 4 | 5 | 5 |
| P5 | 3 | 5 | 3 | 4 | 4 |
| P6 | 5 | 4 | 5 | 3 | 3 |
| P7 | 4 | 5 | 4 | 5 | 5 |
| P8 | 3 | 4 | 5 | 5 | 4 |
| P9 | 5 | 3 | 5 | 4 | 3 |
| P10 | 4 | 5 | 4 | 3 | 5 |
| P11 | 5 | 5 | 3 | 5 | 4 |
| P12 | 5 | 3 | 5 | 4 | 5 |