Module Description


5. Mixers and Reactors: Analysis of the steady and unsteady flow processes in mixers and reactors. Design and analysis of stirred tanks and reactors.

6. Fluid Power: Analysis of the steady and unsteady flow processes in fluid power systems. Design and analysis of hydraulic and pneumatic systems.


10. Turbulence: Analysis of the steady and unsteady flow processes in turbulent flows. Design and analysis of turbulent flows.


12. Turbulence Intensification: Analysis of the steady and unsteady flow processes in turbulence intensification. Design and analysis of turbulence intensification systems.


17. Boundary Conditions: Analysis of the steady and unsteady flow processes at boundaries. Design and analysis of boundary conditions.

18. Turbulence: Analysis of the steady and unsteady flow processes in turbulent flows. Design and analysis of turbulent flows.


20. Turbulence Intensification: Analysis of the steady and unsteady flow processes in turbulence intensification. Design and analysis of turbulence intensification systems.


25. Boundary Conditions: Analysis of the steady and unsteady flow processes at boundaries. Design and analysis of boundary conditions.


27. Turbulence Modeling: Analysis of the steady and unsteady flow processes in turbulent flows. Design and analysis of turbulence models.


29. Control Systems: Analysis of the steady and unsteady flow processes in control systems. Design and analysis of control systems.

30. Fluid Power Systems: Analysis of the steady and unsteady flow processes in fluid power systems. Design and analysis of hydraulic and pneumatic systems.


33. Boundary Conditions: Analysis of the steady and unsteady flow processes at boundaries. Design and analysis of boundary conditions.

34. Turbulence: Analysis of the steady and unsteady flow processes in turbulent flows. Design and analysis of turbulent flows.

35. Turbulence Modeling: Analysis of the steady and unsteady flow processes in turbulent flows. Design and analysis of turbulence models.

36. Turbulence Intensification: Analysis of the steady and unsteady flow processes in turbulence intensification. Design and analysis of turbulence intensification systems.

37. Control Systems: Analysis of the steady and unsteady flow processes in control systems. Design and analysis of control systems.

38. Fluid Power Systems: Analysis of the steady and unsteady flow processes in fluid power systems. Design and analysis of hydraulic and pneumatic systems.


41. Boundary Conditions: Analysis of the steady and unsteady flow processes at boundaries. Design and analysis of boundary conditions.

42. Turbulence: Analysis of the steady and unsteady flow processes in turbulent flows. Design and analysis of turbulent flows.

43. Turbulence Modeling: Analysis of the steady and unsteady flow processes in turbulent flows. Design and analysis of turbulence models.

44. Turbulence Intensification: Analysis of the steady and unsteady flow processes in turbulence intensification. Design and analysis of turbulence intensification systems.

45. Control Systems: Analysis of the steady and unsteady flow processes in control systems. Design and analysis of control systems.

46. Fluid Power Systems: Analysis of the steady and unsteady flow processes in fluid power systems. Design and analysis of hydraulic and pneumatic systems.

47. Multiphase Systems: Analysis of the steady and unsteady flow processes in multiphase systems. Design and analysis of multiphase process systems.


49. Boundary Conditions: Analysis of the steady and unsteady flow processes at boundaries. Design and analysis of boundary conditions.

50. Turbulence: Analysis of the steady and unsteady flow processes in turbulent flows. Design and analysis of turbulent flows.

51. Turbulence Modeling: Analysis of the steady and unsteady flow processes in turbulent flows. Design and analysis of turbulence models.

52. Turbulence Intensification: Analysis of the steady and unsteady flow processes in turbulence intensification. Design and analysis of turbulence intensification systems.

53. Control Systems: Analysis of the steady and unsteady flow processes in control systems. Design and analysis of control systems.

54. Fluid Power Systems: Analysis of the steady and unsteady flow processes in fluid power systems. Design and analysis of hydraulic and pneumatic systems.


56. Process Systems: Analysis of the steady and unsteady flow processes in process systems. Design and analysis of chemical and petrochemical process systems.

57. Boundary Conditions: Analysis of the steady and unsteady flow processes at boundaries. Design and analysis of boundary conditions.

58. Turbulence: Analysis of the steady and unsteady flow processes in turbulent flows. Design and analysis of turbulent flows.

59. Turbulence Modeling: Analysis of the steady and unsteady flow processes in turbulent flows. Design and analysis of turbulence models.

60. Turbulence Intensification: Analysis of the steady and unsteady flow processes in turbulence intensification. Design and analysis of turbulence intensification systems.

61. Control Systems: Analysis of the steady and unsteady flow processes in control systems. Design and analysis of control systems.
Numerical Overview

Aspects of engineering, such as design, build, and analysis, are increasingly relying on computer-based simulation tools. In particular, numerical methods are used to solve a wide range of problems, from simple static structural analysis to complex fluid dynamics calculations. These methods provide a powerful tool for engineers to predict the behavior of materials and systems under various conditions.

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# Module Description

## 3: Mechanical Engineering Systems

### Content:
- **Transfer:** The focus is on understanding the fundamentals of fluid dynamics and heat transfer, including applications in energy systems and buildings. Topics include fluid mechanics, heat transfer, and HVAC systems. Students learn about idealized analogies, 1D and 2D conduction, and heat transfer in buildings and engineering structures.
- **Prerequisites:** Nil
- **Assessment:** Examination, Quizzes and homework, and Project/Report

## 4: Mechanical Systems and Controls

### Content:
- **Transfer:** The focus is on mechanical systems and control systems, including energy methods and buckling. Topics include system modeling, control systems, and feedback mechanisms.
- **Prerequisites:** ME2114
- **Assessment:** Examination, Quizzes and homework, and Project/Report

## 5: Mechanical Design and Manufacturing

### Content:
- **Transfer:** The focus is on mechanical design and manufacturing processes, including design for manufacture and assembly. Topics include design for manufacturing, manufacturing processes, and quality control.
- **Prerequisites:** Nil
- **Assessment:** Examination, Quizzes and homework, and Project/Report

## 6: Advanced Electromagnetics

### Content:
- **Transfer:** The focus is on advanced electromagnetics, including applications in wireless communications and power electronics. Topics include microwave theory, antenna design, and power electronics.
- **Prerequisites:** Nil
- **Assessment:** Examination, Quizzes and homework, and Project/Report

## Learning Outcomes

- Understand the fundamentals of fluid dynamics and heat transfer, including applications in energy systems and buildings.
- Learn about idealized analogies, 1D and 2D conduction, and heat transfer in buildings and engineering structures.
- Understand mechanical systems and control systems, including energy methods and buckling.
- Learn about system modeling, control systems, and feedback mechanisms.
- Learn design for manufacturing, manufacturing processes, and quality control.
- Gain an understanding of advanced electromagnetics, including applications in wireless communications and power electronics.

## Assessment

- Examination
- Quizzes and homework
- Project/Report

## Reading List

- "Feedback and Control Systems" by J. C. Doyle, 3rd Ed. (2000)
- "Mechanical Engineering Design" by W. D. Pilkey, 3rd Ed. (2012)
- "Quality and Reliability Engineering" by R. W. Shavelson, 7th Ed. (2007)
- "Microwave Engineering" by C. A. Balanis, 4th Ed. (2016)
- "Introduction to Electromagnetic Theory" by J. D. Kraus, 3rd Ed. (2008)
- "Microwave Engineering" by C. A. Balanis, 4th Ed. (2008)
Mechanical Engineering - Internal Combustion Engines

Module Title: Internal Combustion Engines

Module Description:

Description of various engines with emphasis on internal combustion engines. Major topics include: Combustion and performance; Combustion chamber design; Air and fuel supply systems; Ignition systems; Performance and operation; Internal combustion engine designs. 

Prerequisites:

AI 1001, AI 2135, and AI 3135.

Corequisites:

None.

Assessment:

Open Book - Final Examination

Additional Information:

Recommended Reading:


"Introduction to Theoretical and Computational Aerodynamics" by Richard J. Bourgeois. Test bank and solutions manual available.


"Mechanical Engineering Design" by G. Kline. Test bank and solutions manual available.


"Thermal Science for Engineers" by G. Kline. Test bank and solutions manual available.
Automotive Control: Introduction and Terminology

Module Code: 584.122
Module Title: Automotive Control: Introduction and Terminology
Instructor: Dr. John Doe
Module Description: This module introduces students to the fundamental concepts and principles of automotive control systems. It covers topics such as sensor technology, signal processing, control theory, and vehicle dynamics. Students will learn how to design and analyze control systems for automotive applications.

Learning Outcomes: By the end of this module, students will be able to:
- Understand the basic principles of automotive control systems
- Analyze the behavior of control systems using mathematical tools
- Design simple control systems for automotive applications

Prerequisites: Basic knowledge of signal processing and control theory
Co-requisites: None
Examination: Midterm Exam (30%) and Final Exam (70%)
Assessment: Project (20%), Assignment (10%), and Participation (10%)

Automotive Control: Advanced Topics

Module Code: 584.123
Module Title: Automotive Control: Advanced Topics
Instructor: Dr. Jane Smith
Module Description: This module delves deeper into advanced topics in automotive control systems. It covers advanced control theories, real-time control systems, and implementation issues in automotive applications. Students will work on designing and implementing control systems for vehicles.

Learning Outcomes: By the end of this module, students will be able to:
- Design advanced control systems for automotive applications
- Implement control systems using real-time operating systems
- Analyze and optimize control systems for performance and robustness

Prerequisites: MATH 211 and PHYS 110
Co-requisites: None
Examination: Midterm Exam (30%) and Final Exam (70%)
Assessment: Project (20%), Assignment (10%), and Participation (10%)

Automotive Control: Advanced Real-Time Systems

Module Code: 584.124
Module Title: Automotive Control: Advanced Real-Time Systems
Instructor: Dr. Michael Johnson
Module Description: This module focuses on the design and implementation of real-time control systems in automotive applications. It covers topics such as real-time processing, scheduling, and fault detection. Students will work on developing real-time control systems for automotive applications.

Learning Outcomes: By the end of this module, students will be able to:
- Design real-time control systems for automotive applications
- Implement real-time control systems using embedded systems
- Analyze and optimize real-time control systems for automotive applications

Prerequisites: MATH 211 and PHYS 110
Co-requisites: None
Examination: Midterm Exam (30%) and Final Exam (70%)
Assessment: Project (20%), Assignment (10%), and Participation (10%)

Automotive Control: Applications

Module Code: 584.125
Module Title: Automotive Control: Applications
Instructor: Dr. Sarah Wilson
Module Description: This module focuses on the application of control systems in automotive engineering. It covers topics such as chassis control, engine control, and automated driving systems. Students will work on designing control systems for automotive applications.

Learning Outcomes: By the end of this module, students will be able to:
- Design control systems for automotive applications
- Implement control systems using automotive electronics
- Analyze and optimize control systems for automotive applications

Prerequisites: MATH 211 and PHYS 110
Co-requisites: None
Examination: Midterm Exam (30%) and Final Exam (70%)
Assessment: Project (20%), Assignment (10%), and Participation (10%)
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