CHEN 5811 - Advanced Transport Phenomena

Fall 2026 Syllabus, Section 01, CRN 42999,

Credit hours: 3

Instructor

Holly Martin

Email: hjmartin02@ysu.edu

Public Instructor Information

Instructor Title:
Professor

Instructor Professional Qualifications:
PhD., Chemical Engineering, Mississippi State University, 2006
B.S., Chemical Engineering, Mississippi State University, 2002

Instructor Office Location:
Moser 2064

Instructor Office Phone:
330-941-3022

Course Description

5811. Advanced Transport Phenomena. Development of basic differential balance equations for mass, momentum and energy. Analytical and approximate solutions to the equation of change with application to the analysis of common engineering problems. Prereq.: CHEN 3786. 3 s.h.

Course Readings

Group	Title	Author	ISBN
Required	Transport Phenomena	R.B. Bird, W.E. Steward, E.N. Lightfoot	0-471-41077-2

The course readings are subject to change in the event of extenuating circumstances, research developments, current events, and/or to ensure better learning.

Schedule of Topics and Assignments

Day	Date	Proposed Topic	Due/To Prepare for Class
Mon	8/24	Brief Syllabus	
Wed	8/26	Vector and Tensor Analysis	
Fri	8/28	Vector and Tensor Analysis	Receive Homework #1
Mon	8/31	Viscosity and Mechanism of Momentum Transport	
Wed	9/2	Viscosity and Mechanism of Momentum Transport	
Fri	9/4	Viscosity and Mechanism of Momentum Transport	Homework #1 Due Receive Homework #2
Mon	9/7	No Class - Labor Day	
Wed	9/9	Shell Balances – Velocity Distributions in Laminar Flow, Newtonian	
Fri	9/11	Shell Balances – Velocity Distributions in Laminar Flow, Newtonian	Homework #2 Due Receive Homework #3

Mon	9/14	Shell Balances – Velocity Distributions in Laminar Flow, Newtonian	
Wed	9/16	Shell Balances – Velocity Distributions in Laminar Flow, Newtonian	
Fri	9/18	Shell Balances – Velocity Distributions in Laminar Flow, Non-Newtonian	Homework #3 Due Receive Homework #4
Mon	9/21	Shell Balances – Velocity Distributions in Laminar Flow, Non-Newtonian	
Wed	9/23	Shell Balances – Velocity Distributions in Laminar Flow, Non-Newtonian	
Fri	9/25	Use of Equations of Change - Momentum Applications	Homework #4 Due
Mon	9/28	Use of Equations of Change - Momentum Applications	Receive Homework #5
Wed	9/30	Use of Equations of Change - Radial Transport	
Fri	10/2	Velocity Distributions with 2 Independent Variables	
Mon	10/5	Thermal Conductivity and the Mechanisms of Energy	Homework #5 Due
Wed	10/7	Thermal Conductivity and the Mechanisms of Energy	
Fri	10/9	Shell Balances - Temperature Distributions in Solids	
Mon	10/12	Shell Balances - Temperature Distributions in Solids	Receive Test 1 - Material from 08/26 - 10/07
Wed	10/14	Shell Balances - Temperature Distributions in Flow	Receive Homework #6
Fri	10/16	use of Equations of Change - Non-Isothermal Systems	Test 1 Due
Mon	10/19	use of Equations of Change - Non-Isothermal Systems	
Wed	10/21	use of Equations of Change - Non-Isothermal Systems	Homework #6 Due
Fri	10/23	Equations of Motion for Forced and Free Convection	
Mon	10/26	Equations of Motion for Forced and Free Convection	Receive Homework #7
Wed	10/28	Equations of Motion for Forced and Free Convection	
Fri	10/30	Dimensionless Numbers	
Mon	11/2	Temperature Distributions with 2 or More Independent Variables	Homework #7 Due Receive Homework #8
Wed	11/4	Temperature Distributions with 2 or More Independent Variables	
Fri	11/6	Diffusivity and the Mechanism of Mass Transport	
Mon	11/9	Diffusivity and the Mechanism of Mass Transport	Homework #8 Due
Wed	11/11	No Class - Veteran's Day	
Fri	11/13	Shell Balances - Concentration Distributions in Solids and in Laminar Flow	
Mon	11/16	Shell Balances - Concentration Distributions in Solids and in Laminar Flow	Receive Test 2 - Material 10/08 - 11/04

Wed	11/18	Shell Balances - Concentration Distributions in Solids and in Laminar Flow	
Fri	11/20	Use of Equations of Change – Multi-Component Systems	Test 2 Due
Mon	11/23	Use of Equations of Change – Multi-Component Sys.	Recieve Homework #9
Wed	11/25	No Class - Thanksgiving Holidays	
Fri	11/27	No Class Thanksgiving Holidays	
Mon	11/30	Use of Equations of Change – Multi-Component Sys.	
Wed	12/2	Use of Equations of Change – Multi-Component Sys.	Homework #9 Due
Fri	12/4	Use of Equations of Change – Multi-Component Sys.	
Mon	12/7	No Class - Final Exam Week	Receive Test 3 - Material 11/06-12/04
Wed	12/9	No Class - Final Exam Week	
Fri	12/11	No Class - Final Exam Week	Test 3 Due

The course schedule, policies, procedures, and assignments in this course are subject to change in the event of extenuating circumstances, by mutual agreement, and/or to ensure better learning.