

The Art and Science of Theatrical Robots

Fall 2025 - CSE 4990 / 6990

Meeting Times:	Mondays, Wednesdays and Fridays 2:00 PM - 3:50 PM		Meeting Location:	MW Butler 102 F Butler 103
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Instructor

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Contributing Theatre Faculty

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Basic Course Information

Course Description

This project-driven course explores the creative and technical integration of robotics and the performing arts. Students collaboratively develop original works of robotic theatre, engaging in every phase of production—from narrative development and world-building to the design, fabrication, and programming of robotic performers. Situated at the intersection of engineering and creative practice, the course emphasizes cross-disciplinary fluency: students gain hands-on experience in robotic system design and implementation while cultivating skills in dramaturgy, movement composition, and theatrical direction. Framed within the context of human-robot interaction (HRI), the course invites students to explore the expressive and communicative

potential of robots in live performance. The experience culminates in a public evening of robotic theatre that showcases the fusion of technical innovation and theatrical artistry.

(Prerequisite: None)

Course Website

All course resources, announcements, and assignments will be provided via Canvas (<https://canvas.msstate.edu>). Students should check Canvas and their university email accounts regularly for updates related to the course.

Textbook & Course Material

No textbook is required for this course. Materials will be provided to students via Canvas and through the course's website: [**https://humanrobotinteraction.com**](https://humanrobotinteraction.com)

Required Hardware & Software

To complete coursework, students will need regular access to a computer with at least one available USB port, internet connectivity, and the ability to run a modern web browser. Laptops are most convenient as they are easily co-located with robots across different environments.

All robotic hardware will be provided.

All necessary tools, equipment, and software will be provided for use throughout the semester.

Course Experience:

Operating less like a traditional class and more like a hands-on production workshop, this course is a journey to create an original work of robotic theatre. You will form a small team and take on a singular challenge: create a compelling work of theatre starring robots you design and build yourselves.

While all essential skills are taught from the ground up, the course is designed to meet you where you are and challenge you to produce your best work.

Together, we will navigate an intensely human, yet remarkably technical journey, fusing the art of storytelling with the engineering of structures and code, striving to create a performance that an audience can genuinely connect with. Expect a fast-paced, collaborative environment where you are constantly making, testing, and refining your ideas.

Learning Goals:

After completing this course, students should be able to:

- Integrate foundational knowledge, skills, and techniques from the performing arts and human-robot interaction to inform the design of social robots for performance contexts.
- Design, fabricate, assemble, and program expressive robotic characters capable of delivering compelling performances in a theatrical environment.
- Design and execute core creative and technical aspects (e.g., story development, dramaturgy, direction, set design, costume design, sound design, lighting design, etc.) of theatrical productions.
- Demonstrate proficiency in integrating robotic characters with theatrical technology (e.g., stage automation, intelligent lighting, projection mapping, etc.) and theatrical production approaches and roles (e.g., creative design and development teams, technical operations teams, etc.).
- Assess the impacts of robot character elements—including appearance, voice, movement, timing, and integration with theatrical elements such as lighting and sound—on audience perception, engagement, empathy, and relatability.
- Critically evaluate and iteratively refine robotic character designs based on storytelling goals, peer/audience perceptions, and technical performance within a theatrical setting.

Coursework & Grading

Your work will be assessed regularly (see *Checkpoints* section) across five categories.

Category	Weight
Story Writing & Refinement Create an original theatrical script featuring robotic characters, this includes: • Crafting a compelling narrative with clear characters, stakes, and emotional arcs. • Developing dialogue and structure that support live performance. • Refining your story through feedback, peer reviews, and dramaturgical exploration.	20%
Robotic Character Design & Development Design and build custom robot characters to perform in your story, this includes: • Creating physical designs that reflect your characters' personalities and roles. • Using the hardware toolkit to fabricate, assemble, and customize your robots. • Designing your robotic character's voice. • Designing and fabricating your robotic character's costume and appearance.	20%
Robotic Character Dynamics & Behavior Program and operate your robots to express themselves convincingly on stage. • Developing expressive behaviors such as gestures, movements, sounds, and lights. • Using provided software tools to choreograph actions in sync with the performance. • Ensuring that robot blocking (positioning and movement on stage) works seamlessly within scenes and enhances visual storytelling. • Coordinating robotic behaviors with other characters—robotic or human—to create clear, engaging, and emotionally resonant interactions.	20%
World Design & Dynamics Create a theatrical world that supports and enhances your story, including: • Designing sets, lighting, sound, and other stage elements to match your narrative tone. • Ensuring the robot characters move and perform effectively within the environment. • Using design to convey mood, theme, and transitions in the performance. • Coordinating robotic performer and technical theatrical elements for a seamless and immersive experience.	20%
Live Performance A public performance will serve as the culmination of your work. This requires: • Presenting a cohesive and engaging show that integrates all course elements. • Participating in structured rehearsals to refine pacing, coordination, and transitions—building rigor, consistency, and confidence in your final performance. • Executing timing, cues, and stage direction with reliability and professionalism. • Troubleshooting and adapting as needed during the live event.	20%

* Graduate students see "Graduate Assignment" for additional requirements.

Teams, Scripts & Shows

After exchanging story ideas and getting to know your classmates, you will be asked to form teams of two to three members to complete the bulk of your semester's work. While each person will be directly responsible for one robotic character's development and performance, teams will work together to create the story that motivates each robotic character's design and shapes the dynamics of the interactions between robotic characters.

Each team will collaboratively write one script that will serve as the guiding foundation for their show and consequently the creative and technical work throughout the semester. While more detailed considerations will be provided in class, there are three primary constraints* to be cognizant of while authoring scripts:

(1) Robotic Leads: all lead characters in a script will be played by robots

(2) Equal Performance Time: all lead characters should receive approximately equal performance time

(3) Show Runtime: scripts with two lead characters should have a runtime between 8 - 10 minutes, and scripts with three lead characters should have a runtime between 12 - 15 minutes.

** As with all aspects of the course, constraints may be adjusted after discussion and consensus among the students and instructor.*

Checkpoints

Your overall course grade will be a product of your work across the five categories described in the table above. **Timely and good-faith efforts to achieve the goals within each category are critical to achieving full credit.** Concrete evaluations of progress across each area will be performed via brief and regular in-class demonstrations and through the submission of digital show assets via Canvas. The checkpoints contributing to each category include*:

Story Writing & Refinement

- Initial story ideas submission
- Team / Group formation
- Team script first submission
- Team script revised + blocking notes submission
- Team script - final version submission

Robotic Character Design & Development

- Initial robotic character sketches and concept document submission
- Demonstration of robotic character's physical structure design
- Demonstration of robotic character's costume design
- Demonstration of robotic character's voice design
- Submission documenting final robotic character design

Robotic Character Dynamics & Behavior

- Demonstration of robotic character gestures.
- Demonstration of robotic character blocking.
- Demonstration of character interactions via rehearsals.
- Submission of all robotic character behavior and voice files.

World Design & Dynamics

- Initial conceptual designs of world document submission.
- Demonstration of world design and dynamics via rehearsals.
- Submission of lighting looks and cues.
- Submission of audio assets and cues.
- Submission of digital scenic assets and documentation of physical assets.

Live Performance

- Participation in rehearsals and final performance.
- Demonstration of show and character meeting all requirements via final performance.
- Submission of final feedback and reflections on project.

* Minor changes to checkpoints may occur throughout the semester. Submission and demonstration dates will be announced as each area is covered.

Public Performance

Final performances will be conducted as an evening of robotic theatre in which each group will perform their show one after another for an audience. This performance will take place on November 21st, from 7:30 PM to 9:00 PM in McComas Hall Theatre and will be open to the public.

Graduate Assignment & Overall Grading Scheme

Students enrolled in the graduate section of the course (6XXX) will submit two-page summaries and critiques of two recent journal articles or substantial conference papers related to human-robot interaction in the performing arts.

These assignments will be weighted as 10% of the student's final grade, while the other coursework will be weighted as 90% of the final grade.

Overall Grading Scale

A	B	C	D	F
90% - 100%	80% - 89%	70% - 79%	60% - 69%	0% - 59%

Topic Schedule*

Week	Monday	Wednesday	Friday
1	Social Robots & HRI	Story & Expression	Storytelling on Stage
2	Anatomy of a Robot	Designing & Building Robots	Robots on Stage (+Scene partners)
3	Locomotion & Blocking	Voice & Gesture	Costuming
4	Scenic Design	Lighting & Projection	Sound Design
5	Show Control & Wizarding	Blocking Rehearsals	Run-throughs
6	Dress-Tech Rehearsals	Dress Rehearsals	Performance
7	Reflection & Documentation	Thanksgiving Holidays	
8	Last Day of Class		

* This schedule is an approximation and will be updated throughout the semester.

Topic Outline & Contact Hours

Storytelling (2 contact hours)

Social Robots (8 contact hours)

Social Robots & HRI (3 hours)

Anatomy of Robots (3 hours)

Designing and Building Robots (2 hours)

Designing Robotic Characters for the Stage (14 contact hours)

Robots on Stage (3 hours)

Robot Locomotion (2 hours)

Robot Blocking (3 hours)

Voice & Gesture (3 hours)

Costuming (3 hours)

Technical Theatre with Robots (12 contact hours)

Scenic Design (3 hours)

Lighting and Projection (3 hours)

Sound Design (3 hours)

Show Control & Wizarding (3 hours)

Performance & Documentation (9 contact hours)

Rehearsal Process (3 hours)

Performance Process (3 hours)

Documentation (2 hours)

Project Reflection (1 hour)

Policies

Classroom Policy & Attendance

Attendance of all class meetings is expected (see AOP 12.09). Students should notify the instructor as soon as possible about a planned or unexpected absence from class.

Class Make-Up Policy

Students should work with the instructor in advance (at least a week ahead) to make plans for completing any work that will be missed due to a planned absence. If an unplanned excused absence (defined in AOP 12.09) occurs, it is the student's responsibility to contact the instructors as soon as possible to arrange make up work.

AI Policy: Permitted in This Course with Attribution

Students are permitted and encouraged to use Generative AI Tools to support their work in this course. Students must give credit and cite any AI-generated material according to rules of documentation including in-text citations, quotations, and references. Students should always include documentation that describes the specific tools used and the nature of their use (e.g., brainstorming, grammatical correction, variant generation, etc.).

Communication Policy

Emails will be sent by the instructors to your msstate.edu email account. Messages may also be posted on and sent from Canvas.

University Policies

The Mississippi State University Syllabus contains all policies and procedures that are applicable to every course on campus and online. The policies in the University Syllabus describe the official policies of the University and will take precedence over those found elsewhere. It is the student's responsibility to read and be familiar with every policy.

The University Syllabus may be accessed at any time on the Provost website under Faculty and Student Resources and at: <https://www.provost.msstate.edu/faculty-student-resources/university-syllabus>

Student Honor Code

Mississippi State has an approved Honor Code that applies to all students. The code is as follows: "As a Mississippi State University student, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do." Upon accepting admission to Mississippi State University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor Code. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the MSU community from the requirements or the processes of the Honor Code. For additional information, please visit: <http://honorcode.msstate.edu/policy>.

Syllabus Revision Log

Revision	Changes
2025.09.06.01	Initial version.