CYBER-PHYSICAL SYSTEMS MINOR

Cyber-Physical Systems Minor

With the fourth industrial revolution upon us, physical systems are being designed to have a cyber component, that enables remote access, monitoring and control. In these systems, ubiquitous sensing, and advanced data management capability are taking us from automation to autonomy via a deep interconnection between the cyber and physical entities. Cyber-physical systems (CPS) are becoming abundant in many application sectors including manufacturing, energy, health care, transportation and agriculture. Safety-, time- and life-critical systems are relying on CPS concepts to become more efficient, robust, resilient, flexible and scalable. As CPS applications become more pervasive, the engineering education system needs to produce a next generation CPS workforce who can design, produce, and maintain these systems.

With this motivation and encouraged by the demand from the industry stakeholders of ISU College of Engineering, this CPS minor will focus on sensing, advanced information processing (data analytics and machine learning), and controls aspects of Cyber-Physical Systems. Specific CPS application sectors such as energy/power systems, manufacturing, biomedical devices, autonomous systems, transportation, and agriculture will be in focus.

The minor requires 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. The minor must include 9 credits that are not used to meet any other department, college, or university requirement.

Required courses:

M E 280X	Design and Analysis of Cyber-Physical Systems	3
CPR E 287X	Cyber-Physical Systems	3
AER E 364X	Cyber-Physical Systems Application	3
Elective courses:		6
M E 370	Engineering Measurements	
M E 411	Automatic Controls	
M E 418	Mechanical Considerations in Robotics	
M E 421	System Dynamics and Control	
M E 456	Machine Vision	
M E 475	Modeling and Simulation	
E E 324	Signals and Systems II	
E E 333	Electronic Systems Design	
E E 425	Machine learning: A Signal Processing Perspective	
E E 476	Control System Simulation	
CPR E 230	Cyber Security Fundamentals	
CPR E 388	Embedded Systems II: Mobile Platforms	
CPR E 414	Introduction to Software Systems for Big Data Analytics	
CPR E 419	Software Tools for Large Scale Data Analysis	
CPR E 421	Software Analysis and Verification for Safety and Security	
CPR E 458	Real Time Systems	
CPR E 488	Embedded Systems Design	
A B E 403	Physical Modeling and Control of Dynamic Systems	
A B E 404	Instrumentation for Agricultural and Biosystems Engineering	
A B E 410	Electronic Systems Integration for Agricultural Machinery	
I E 413	Stochastic Modeling, Analysis and Simulation	
I E 432	Industrial Automation	
I E 487	Big Data Analytics and Optimization	
AER E 365X	Avioonics and Controls Laboratory	
AER E 407	Applied Formal Methods	
AER E 433	Spacecraft Dynamics and Control	
AER E 463	Introduction to Multidisciplinary Design Optimization	
AER E 464	Spacecraft Systems	
C E 449	Structural Health Monitoring	
C E 553	Traffic Engineering	
C E 556	Transportation Data Analysis	
Total Credits		**15**