

Program Approval

I. General Information

A. **Institution** Kansas State University

B. Program Identification

Degree Level: Bachelor's Program
Program Title: Robotics and Autonomous Systems
Degree to be Offered: Bachelor of Science in Robotics and Autonomous Systems
Responsible Department or Unit: Integrated Studies
CIP Code: 14.4201 Mechatronics
Modality: Hy-flex
Proposed Implementation Date: Fall 2026

Total Number of Semester Credit Hours for the Degree: 120

II. **Clinical Sites:** Does this program require the use of Clinical Sites? no

III. Justification

In today's rapidly evolving world, students are driven by a desire to find meaningful and fulfilling careers that positively contribute to society. They seek opportunities to be part of something bigger, applying their skills to improve lives, support communities, and innovate for a sustainable future. The Robotics and Autonomous Systems degree at K-State Salina is designed to fulfill these aspirations, equipping students with the skills to understand, design, build, and deploy robot systems capable of addressing real-world challenges.

This program provides hands-on experience and applied learning that aligns with K-State's Strategic Plan, which emphasizes experiential learning that extends beyond traditional classroom education. Further, this program plays a key role in supporting the Salina Campus's Opportunity Initiatives of Advanced Air Mobility and Autonomous Systems and Robotics to position K-State Salina as the first-choice education and business partner in Kansas and promote a culture of academic innovation in an emerging field.

By preparing graduates to meet the rising demand for automation in industries such as agriculture, manufacturing, and beyond, the program also supports economic growth within the region. The degree aligns with the increasing emphasis on Industry 4.0, where robotics and automation are integral to global competitiveness. The field of robotics is experiencing unprecedented growth, with a high demand for skilled professionals ready to design and deploy autonomous systems in various industries. This program not only offers graduates excellent career opportunities but also positions them to be at the forefront of an industry poised to reshape our world.

IV. Program Demand: Market Analysis

This report utilizes labor market analytics from Lightcast, which curates data from the Integrated Postsecondary Education Data System (IPEDS). To define the robotics and autonomous systems landscape, the following Classification of Instructional Program (CIP) codes were used:

- 14.4201: Mechatronics, Robotics, & Automation Engineering
- 15.0405: Robotics Technology/Technician
- 15.0406: Automation Engineer Technology/Technician
- 15.0407: Mechatronics, Robotics, & Automation Engineering Technology/Technician

Strong Learner & Industry Demand

The robotics field is experiencing explosive growth, with total degree and certificate completions in these CIP codes increasing from 775 in 2014 to 4,192 in 2023. While shorter credentials account for more than half of all

completions, bachelor's degree completions specifically surged from 85 in 2014 to 712 in 2023, a 737.6% increase. This vastly outperforms the -1.0% trend for all U.S. baccalaureate degrees during the same period. Globally, the market is projected to reach between \$160 billion and \$260 billion by 2030.

Regional Competitive Advantage

As of 2023, no institutions in the Five-State Region (KS, CO, MO, NE, OK) awarded degrees in these specific CIP codes. However, Oklahoma State University now offers a [Bachelor's of Science in Mechatronics and Robotics](#), the Oklahoma State University Institute of Technology offers a [Bachelor of Technology in Instrumentation Engineering Technology](#), the University of Central Missouri offers a [Bachelor of Science in Engineering: Robotics, Automation, and Controls](#), Colorado State University-Pueblo offers a [Bachelor of Science in Mechatronics Engineering](#), and the Metropolitan State University of Denver offers a Bachelor of Science in [Advanced Manufacturing Sciences](#). This presents a significant opportunity for K-State to capture market share, as regional demand is currently met by programs using different classifications. Furthermore, strong recruitment pipelines already exist; high school robotics competitions like FIRST involve over 100,000 students annually, with local teams in Manhattan and Salina providing a direct interest group for undergraduate recruitment.

Robust Labor Market & Skill Gaps

The employment outlook in Kansas and the surrounding region is exceptionally strong:

- **Regional Growth:** Jobs in related occupations are projected to grow 12.7% through 2033, exceeding the 11.8% growth rate for all other degree-requiring occupations in the region.
- **Kansas Leadership:** Kansas leads the five-state region (KS, CO, MO, NE, OK) with the highest projected job growth rate at 14.9%.
- **Industrial Density:** Kansas ranked fourth nationally for the percentage of manufacturing plants utilizing industrial robots.
- **Skill Gaps:** Gaps between employer demand and job-seeker profiles exist for 20 of the top 25 specialized skills. Lightcast identifies skills like Automation and Robot Frameworks as "Rapidly Growing," with projected two-year growth rates exceeding 25%.

Strategic Alignment with Kansas Priorities

A robotics program directly supports state economic mandates:

- The [Kansas Framework for Growth](#) (2021) identified Advanced Manufacturing and Logistics as "Target Sectors" and recommended investing in university innovation centers for robotics and automation.
- The [Kansas Board of Regents \(2021\)](#) identified "Digital Transformation & Automation" as a key area of opportunity.
- Local industry momentum is evidenced by [Chipotle's \\$50 million investment in Kansas-based Greenfield Robotics](#) to scale autonomous farming solutions.

Opportunity for Partnerships

Current similar offerings, such as WSU Tech's or Garden City Community College's two-year robotics program, provide foundational skills through a few courses that overlap with the proposed degree's emphasis areas. The new K-State bachelor's degree program is designed to build upon this base, creating a direct pathway for WSU Tech graduates to advance their expertise at the bachelor's level. This approach not only strengthens academic and career trajectories for students but also fills an educational gap by providing a comprehensive, advanced curriculum that supports the growing industry need for professionals skilled in designing, implementing, and managing robotics and autonomous systems.

Conclusion

K-State is uniquely positioned to bridge the current educational gap in the region by providing a comprehensive, advanced curriculum that builds upon foundational skills found in two-year programs. With significant projected growth in the field, zero direct competition within the regional bachelor's degree market, and clear alignment with state priorities, this program is poised for success. By serving as a pioneer in robotics education, K-State will

attract a new generation of learners eager to drive the next wave of technological innovation and meet the growing industry need for skilled professionals in robotics and autonomous systems.

V. Projected Enrollment for the Initial Three Years of the Program

Year	Total Headcount Per Year		Total Sem Credit Hrs Per Year	
	Full- Time	Part- Time	Full- Time	Part- Time
Implementation	20	2	600	30
Year 2	35	3	~1085	45
Year 3	50	5	~1550	75

VI. Employment

The employment landscape for robotics graduates is exceptionally promising, with a strong upward trajectory in job demand both regionally and nationally. Unique job postings in the five-state region (KS, CO, MO, NE, OK) increased by 11.1% between 2019 and 2023, with Kansas seeing a remarkable 134.6% growth in job listings over the same period. This surge points to a robust demand for robotics professionals in the state, making it an ideal time for Kansas State University to launch a Robotics and Autonomous Systems program that meets this need.

The future job market in robotics is equally encouraging. The Market Demand Report prepared at K-State projects a substantial rise in robotics-related job postings across the United States over the next two years, highlighting the long-term relevance and demand for skills in this field. Graduates with expertise in robotics and autonomous systems will enter a workforce that is eager for their specialized skills, ensuring high demand and job stability for years to come.

Internationally, the robotics market is also poised for rapid growth. Market Insights by Statista (2021) indicates that the global mobile robot market size is expected to grow around 23% from 2021 to 2028. As mobile robots become increasingly essential across sectors—ranging from agriculture and logistics to healthcare and manufacturing - the skill sets developed in a robotics program will be crucial for industries seeking to innovate and remain competitive.

In this dynamic market, K-State graduates will be well-prepared to make an immediate impact. With specialized training in robotics, automation, and machine learning, they'll be equipped to address workforce needs, tackle emerging challenges, and lead innovation both locally and globally. This program offers students a pathway to fulfilling, impactful careers while supporting the economic growth and technological advancement of Kansas and beyond.

VII. Admission and Curriculum

A. Admission Criteria

The Qualified Admission criteria are used, as this program does not have separate admission requirements.

B. Curriculum

Autonomous Mobile Robotics Emphasis

Year 1: Fall

SCH = Semester Credit Hours

Course #	Course Name	SCH
MATH 100	College Algebra (SWGE 030)	3
ECET 100	Basic Electronics	3
CYBR 180	Introduction to Database Systems	3
MET 121	Manufacturing Methods	3
RAS 212	Introduction to Robot Operating System	3

Year 1: Spring

Course #	Course Name	SCH
	Arts/Humanities Course (SWGE 060)	3
ENGL 100	Expository Writing I (SWGE 010)	3
MATH 150	Plane Trigonometry	3
MET 117	Mechanical Modeling and Detailing	3
CYBR 250	Hardware and Network Fundamentals	3

Year 2: Fall

Course #	Course Name	SCH
MATH 220	Analytical Geometry & Calculus I	4
CMST 302	Applications in C Programming for Engineering Technology	3
RAS 260	Path Planning and Navigation	3
MLAS 100	Survey of Machine Learning and Autonomous Systems	3
ENGL 200	Expository Writing II (SWGE 010)	3

Year 2: Spring

Course #	Course Name	SCH
PHYS 113	General Physics I (SWGE 040)	4
RAS 225	Robot Power Systems	3
RAS 268	Mobile Robotics Navigation Studio	1
ECET 340	Electronics Manufacturing	3
ECET 350	Microprocessor Fundamentals	3

Year 3: Fall

Course #	Course Name	SCH
ECET 304	Electric Power and Devices	3
ECET 354	Microcontroller Applications	3
RAS 320	Sensors and Perception for Robotics	3
RAS 335	Digital Manufacturing	3
ENGL 302	Technical Writing	3

Year 3: Spring

Course #	Course Name	SCH
	Social & Behavioral Sciences Course (SWGE 050)	3
	Arts & Humanities Course (SWGE 060)	3
COMM 106	Public Speaking I (SWGE 020)	3
MET 382	Industrial Instrumentation and Controls	3
RA 357	Machine Vision	3
RAS 348	Mobile Robotics Fabrication Studio	1

Year 4: Fall

Course #	Course Name	SCH
	Social & Behavioral Sciences Course (SWGE 050)	3
	Institutional Designated Course (SWGE 070)	3
ETB 310	Applied Data Analysis and Tools	3
BUS 410	Managerial and Project Economics	3
RAS 455	Embedded Systems in Robotics	3
RAS 480	Robotics Capstone I	1

Year 4: Spring

Course #	Course Name	SCH
	Upper Division (300 and above) Elective Coursework	4
	Institutional Designated Course (SWGE 070)	3
RAS 415	Robot Design and Kinematics	3
RAS 458	Mobile Robotics Embedded Development Studio	1
RAS 481	Robotics Capstone II	2

Total Number of Semester Credit Hours..... 120

Industrial Robotics and Automation Emphasis**Year 1: Fall**

SCH = Semester Credit Hours

Course #	Course Name	SCH
MATH 100	College Algebra (SWGE 030)	3
ECET 100	Basic Electronics	3
CYBR 180	Introduction to Database Systems	3
MET 121	Manufacturing Methods	3
	Arts & Humanities Course (SWGE 060)	3

Year 1: Spring

Course #	Course Name	SCH
ENGL 100	Expository Writing I (SWGE 010)	3
COMM 106	Public Speaking (SWGE 020)	3
MATH 150	Plane Trigonometry	3
MET 117	Mechanical Modeling and Detailing	3
MET 230	Automated Manufacturing I	3

Year 2: Fall

Course #	Course Name	SCH
MATH 220	Analytical Geometry & Calculus I	4
CMST 302	Applications in C Programming for Engineering Technology	3
MET 211	Statics	3
PHYS 113	General Physics I (SWGE 040)	4
MET 240	Industrial Robotics Laboratory	2

Year 2: Spring

Course #	Course Name	SCH
ECET 350	Microprocessor Fundamentals	3
MET 245	Material Strengths and Testing	3
MET 264	Machine Design	4
CYBR 250	Hardware and Networking	3
	Social & Behavioral Sciences Course (SWGE 050)	3

Year 3: Fall

Course #	Course Name	SCH
ENGL 200	Expository Writing II (SWGE 010)	3
ECET 304	Electric Power and Devices	3
ECET 354	Microcontroller Applications	3
ETB 310	Applied Data Analysis and Tools	3

RAS 358	Industrial Inspection Systems	2
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Year 3: Spring

Course #	Course Name	SCH
MET 382	Industrial Instrumentation and Controls	3
RA 305	Robotics Programming	3
COT 301	Six Sigma Analysis and Problem Solving I	1
COT 302	Six Sigma Analysis and Problem Solving II	1
ECET 385	Advanced Programmable Logic Controllers	3
	Upper Division (300 and above) Elective coursework	4

Year 4: Fall

Course #	Course Name	SCH
ENGL 302	Technical Writing	3
	Social & Behavioral Science Course (SWGE 050)	3
	Institutional Designated Course (SWGE 070)	3
RAS 387	Data Acquisition and Monitoring	2
MET 336	Dynamics of Machines	3
RAS 480	Robotics Capstone I	1

Year 4: Spring

Course #	Course Name	SCH
	Business Elective	3
	Arts & Humanities Course (SWGE 060)	3
	Institutional Designated Course (SWGE 070)	3
RA 357	Machine Vision	3
RAS 481	Robotics Capstone II	2

Total Number of Semester Credit Hours.....120

VIII. Core Faculty

Note: * Next to Faculty Name Denotes Director of the Program, if applicable
 FTE: 1.0 FTE = Full-Time Equivalency Devoted to Program

Faculty Name	Rank	Highest Degree	Tenure Track Y/N	Academic Area of Specialization	FTE to Proposed Program
Chad Bailey*	Instructor	Masters	N	Robotics	1.0
Balaji Balasubramaniam	Assistant Professor	PhD	Y	Intelligent Systems Design	0.125
Timothy Bower	Professor	Masters	Tenured	Robotics	0.5
Julia Morse	Associate Professor	Masters	Tenured	Automation	0.5
Eduard Plett	Professor	PhD	Tenured	Automation	1.0
Doug Zerr	Instructor	Masters	N	Manufacturing	0.125
Annie Hoekman	Assistant	PhD	N	Cyber Security	0.125

	Teaching Professor				
New Hire	Instructor	Masters	N	Mobile Robotics	1.0

Number of graduate assistants assigned to this program 0

IX. Expenditure and Funding Sources

A. EXPENDITURES	First FY	Second FY	Third FY
Personnel – Reassigned or Existing Positions			
Faculty	\$ 270,396	\$ 275,804	\$ 281,320
Administrators (<i>other than instruction time</i>)	\$ 34,639	\$ 36,371	\$ 38,189
Graduate Assistants			
Support Staff for Administration (<i>e.g., secretarial</i>)	\$ 12,000	\$ 12,600	\$ 13,230
Fringe Benefits (<i>total for all groups</i>)	\$ 92,656	\$ 97,289	\$ 102,153
Other Personnel Costs			
Total Existing Personnel Costs – Reassigned or Existing	\$ 409,691	\$ 422,064	\$ 434,892
Personnel – New Positions			
Faculty	\$ -	\$ -	\$ 75,000
Administrators (<i>other than instruction time</i>)			
Graduate Assistants			
Support Staff for Administration (<i>e.g., secretarial</i>)			
Fringe Benefits (<i>total for all groups</i>)			\$ 17,250
Other Personnel Costs			
Total Existing Personnel Costs – New Positions	\$ -	\$ -	\$ 92,250
Start-up Costs - One-Time Expenses			
Scholarship Support	\$ 25,000	\$ 25,000	\$ 25,000
Equipment/Technology	\$ 150,000	\$ 2,520	\$ 5,040
Physical Facilities: Construction or Renovation			
Other (Marketing)	\$ 80,000	\$ 30,000	\$ 30,000
Total Start-up Costs	\$ 255,000	\$ 57,520	\$ 60,040
Operating Costs – Recurring Expenses			
Supplies/Expenses	\$ 126	\$ 252	\$ 252
Library/learning resources			
Equipment/Technology	\$ 2,000	\$ 2,000	\$ 2,000
Travel	\$ 1,487	\$ 2,947	\$ 2,947
Other			
Total Operating Costs	\$ 3,613	\$ 5,199	\$ 5,199

GRAND TOTAL COSTS	\$ 668,304	\$ 484,783	\$ 592,381

B. FUNDING SOURCES <i>(projected as appropriate)</i>	Current	First FY (New)	Second FY (New)	Third FY (New)
Tuition / State Funds		\$ 233,654	\$ 419,094	\$ 602,680
Student Fees		\$ 3,400	\$ 4,400	\$ 6,100
Other Sources				
GRAND TOTAL FUNDING		\$ 237,054	\$ 423,494	\$ 608,780
C. Projected Surplus/Deficit (+/-) (Grand Total Funding <i>minus</i> Grand Total Costs)		\$ (431,250)	\$ (61,289)	\$ 16,399

X. Expenditures and Funding Sources Explanations

A. Expenditures

1. Personnel – Reassigned or Existing Positions

A combined 4.125 FTE will come from faculty members involved in this program.

2. Personnel – New Positions

A single faculty position at 1.0 FTE is anticipated by year three of the program. A varying number of adjunct instructors will be critical to the success of this program from the standpoint of content currency and relevancy and will share the teaching load and we currently estimate this need at 0.25 of an FTE per semester.

3. Start-up Costs – One-Time Expenses

Getting the Robotics and Autonomous Systems (RAS) program off the ground requires a significant initial investment to ensure it has the right facilities, equipment, and faculty to succeed. This funding will come from corporate partners, government grants, and private donations, helping to cover everything from robotics labs to cutting-edge technology and research support. While launching a new program comes with financial challenges, careful planning and industry collaboration will help manage costs and keep the program sustainable.

One of the biggest upfront expenses is developing lab space and infrastructure. The program needs a dedicated robotics lab where students can work with automation systems, mobile robots, and AI-driven technologies. This means renovating existing spaces, upgrading safety measures, and ensuring the facilities meet industry and academic standards. Equipment and technology will also be a major investment, including robotic arms, autonomous vehicles, and advanced sensors. Since these tools can be expensive, the program will share some resources with other departments like Uncrewed Aircraft Systems (UAS), Machine Learning, and Mechanical Engineering Technology, maximizing efficiency and reducing costs.

Managing costs effectively is crucial. To address this, the program will phase in investments over time, ensuring that major purchases align with student growth and funding availability. It will also leverage

partnerships with companies to provide equipment sponsorships and research funding.

By securing funding from multiple sources, sharing resources, and rolling out the program strategically, KSU-Salina will create a leading robotics education hub while ensuring long-term sustainability and financial success

4. Operating Costs – Recurring Expenses

Limited to office costs and travel

B. Revenue: Funding Sources

Part time students are calculated at 15 hours annually (6 hour per semester twice per year, plus a single three hour course over the summer); whereas full time are estimated at 30 hours (15 hours per semester twice per year). Using a blended tuition rate of in-state and out-of-state of **\$370.88**, we then take the total estimated credit hours for full time and part time students. We assume that more full-time students, than part time students, will be enrolled in this program; additionally, we also assume more in-state students will be enrolling in this program due to the audience we will be marketing towards.

This proposal will roll the existing Robotics and Automation Engineering Technology degree into a new combined program. With the existing students and marketing, we estimate – in the first year - based on 32 total students enrolled in 630 credit hours that we will bring in roughly \$234,000 of tuition revenue for the starting year. As enrollment increases, while taking into account RAS program expenditures, we estimate that we will break even in the third year.

C. Projected Surplus/Deficit

The campus intends to develop a digital marketing campaign for this program. We expect program enrollments to increase after the second year of the program. These early cash marketing expenditures will help us to realize the estimated ROI. Additionally, we recognize that the blended tuition rate might not be the only approximation method for forecasting ROI. This ROI method only takes into account gross tuition, it does not take into account other possible funding streams (e.g., government grants, corporate research funding, or private donations).

XI. References and Sources for New Degree Program Proposal

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