Program Approval

I. General Information

A. Institution Kansas State University

B. Program Identification

Degree Level:	Bachelor's Program
Program Title:	Nuclear Engineering
Degree to be Offered:	Bachelor of Science in Nuclear Engineering
Responsible Department or Unit:	Alan Levin Department of Mechanical and Nuclear Engineering
CIP Code:	14.2301
Modality:	Face-to-Face
Proposed Implementation Date:	Fall 2025

Total Number of Semester Credit Hours for the Degree: 123

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

III. Justification

Kansas State University (KSU) has a rich tradition in the field of nuclear engineering. In 1952, KSU established a nuclear engineering curriculum in the Department of Chemical Engineering, followed in 1958 by the creation of a dedicated Department of Nuclear Engineering. In 1964, KSU's nuclear engineering program was the first in the nation to gain accreditation. Over the next 30 years, KSU graduated many nuclear engineers who went on to become national and world leaders in the field. Due to a nationwide decline in perceived demand for nuclear engineers, KSU joined many other universities in discontinuing its Bachelor of Science (BS) in Nuclear Engineering (NE) program in 1996. However, KSU preserved nuclear engineering education at the undergraduate level by creating the NE Option, a subplan for the BS in Mechanical Engineering (ME) program. The NE Option presently consists of four technical elective courses in the junior and senior years: Radiation Protection and Shielding, Principles of Radiation Detection, Nuclear Reactor Theory, and Nuclear Reactor Laboratory. All students pursuing the BS ME degree are required to take an introductory course in nuclear engineering, and an elective course on nuclear reactor operations is available for students who wish to gain experience with the KSU Research Reactor, a federally licensed non-power reactor facility. **KSU has the only nuclear engineering program at any level in the State of Kansas.**

Demand for the NE Option has increased considerably in recent years, likely driven by availability of generous academic scholarships, student and parent recognition of degree versatility, and employer demand. In the period 2017-2024, an average of 10 students per year graduated after completing the NE Option subplan. An average of 22 students were enrolled each semester in the first course of the NE Option, Radiation Protection and Shielding, with 30 students enrolled in Fall 2024. Estimates based on the number of students who have declared the NE Option indicate a BS NE student body of between 70 and 90 students in AY 2025-2026, with further growth fueled by dedicated recruiting that is not presently available to the NE Option and increased employer demand as nuclear power takes a more prominent role in the US energy mix.

In response to feedback from the Mechanical and Nuclear Engineering Industrial Advisory Board, input from NE Option graduates, and informal discussions with current students, nuclear engineering faculty explored the possibility of modifying the existing NE Option subplan to produce a KBOR-compliant, ABET-accreditable BS NE program. Minor modifications to the NE Option subplan of the BS ME degree were required, mainly to meet program specific requirements imposed by ABET. In the process, two credit-hours were eliminated from the curriculum, reducing the required number of credit-hours to complete the degree from 125 to 123. **Most importantly, the proposed BS NE program requires no additional faculty and conservative estimates**

indicate that the program will be immediately profitable for KSU.

It is also important to note that BS NE and BS ME degree programs include some similar coursework, which is typical for these degrees at other universities. Under existing BS ME program policies and proposed BS NE program policies, a student could obtain the BS ME and BS NE in as few as 131 credit-hours and in four years. **Therefore, students will have a clear path to obtaining the BS ME degree while also obtaining the BS NE degree. This is likely to be of increased interest to students prior to BS NE degree ABET accreditation, which is anticipated to occur in 2029.**

IV. Program Demand: Market Analysis

The primary customers for this major are expected to be on-campus students who plan to enter the nuclear engineering workforce in Kansas or at other locations in the United States. **KSU has the only nuclear engineering program in Kansas at any level and is poised to become a regional leader in undergraduate nuclear engineering education**. Similar undergraduate programs exist at Colorado School of Mines (n.d.) and Missouri University of Science and Technology (n.d.), but there are no colleges or universities offering BS NE degrees in Nebraska, South or North Dakota, Minnesota, Iowa, Oklahoma, or Arkansas. Oklahoma State University (n.d.) and the University of Texas-Austin offer a nuclear engineering minor (n.d.). Texas A&M University offers the BS NE degree (n.d.), but many students from Texas to seek engineering degrees at Kansas State University for various reasons. The University of New Mexico offers a BS NE degree (n.d.), as well.

Demand for nuclear engineering courses at KSU as judged by enrollment in the NE Option subplan has been substantially increasing over the last few years. From 2019-2021, an average of 35 students each academic year pursued the NE Option subplan. Over the last few years, that number has increased to 58 students in AY 2023-2024, representing an increase of more than 65%. This increase in students pursuing the NE Option is likely related to the availability of scholarships for nuclear engineering students, through professional organizations such as the American Nuclear Society (n.d.) and federal agencies such as the US Department of Energy (Nuclear Energy University Programs, n.d.), and the recent bipartisan recognition (U.S. Senate Committee on Environment & Public Works, 2024) that nuclear power must play a prominent role in baseload power generation as demand for electrical power continues to increase in the United States and across the world.

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	83	0	450	0
Year 2	87	0	468	0
Year 3	90	0	486	0

NE Option enrollment for students classified as juniors or seniors was 22 in 2021, 26 in 2022, and 41 in 2023. We expect that the growth trends would continue and then level off, with projected numbers of 50 in AY2026, 55 in AY2027, 58 in AY2028, and 60 in AY2029.

The total headcount in the proposed program in AY26, AY27, and AY28, was estimated by multiplying the projected numbers for these years based on junior/senior NE option students by a factor of 1.5. This factor accounts for freshmen and sophomore contributions to the headcount while conservatively accounting for students who enter the program greater than freshman status due to transfer credits and current students who may elect to remain in the NE Option.

Only required NE courses were included in the calculation of total semester credit hours per year shown above. These values were calculated by assuming that 20% of the headcount takes each required NE course each year. This conservatively assumes an average time to graduation of 5 years. The proposed program is designed for students to complete the BS NE degree in 4 years with reasonable courseloads each semester.

VI. Employment

Nuclear engineering is a versatile discipline with graduates that work in the commercial power, government, defense, and health sectors of the economy. Within the State of Kansas and the greater Kansas City metropolitan area, nuclear engineers work for entities including Honeywell Kansas City National Security Campus, Wolf Creek Nuclear Operating Corporation, Evergy, Enercon, Kiewit, Burns and McDonnell, Kansas Department of Health and Environment, and Radiation Detection Technologies, Inc., a Manhattan, Kansas-based small business that was founded out of the KSU Semiconductor Materials and Radiological Technologies Laboratory. Across the country, nuclear engineering graduates from KSU work at NASA's Lyndon B. Johnson Space Center, Westinghouse, General Electric-Hitachi, Nebraska Department of Health and Human Services, Bettis Atomic Power Laboratory, Los Alamos National Laboratory, Idaho National Laboratory, Naval Information Warfare Systems Center Pacific, and Oak Ridge National Laboratory, among others.

The US Bureau of Labor and Statistics (BLS) Occupational Outlook Handbook (2023) indicates a small decline in the number of nuclear engineering positions over the next decade; however, the job outlook predicts about 700 openings for nuclear engineers per year on average over the period of 2023-2033, driven by retirements in the nuclear engineering workforce. BLS estimates do not account for the requisite expansion of nuclear power in the US to meet increasing demand, driven higher by data centers feeding the on-going AI boom. For example, **nuclear electric power generation jobs increased by nearly 1600 in 2023** alone (U.S. Department of Energy, 2024), far outpacing the BLS outlook. Furthermore, a recent US Department of Energy report (2024) on advanced nuclear power commercial deployment indicates that **a workforce of nearly 400,000 people is required to meet US Government nuclear energy production goals by 2050**. A large fraction of that workforce will consist of nuclear engineers who work on design, licensing, and operation of nuclear power plants. Nuclear engineers are well-compensated, with **2023 median pay of $125,460 per year for roles that typically require only a bachelor's degree and no work experience in a related occupation** (U.S. Bureau of Labor Statistics, 2023). In summary, demand for nuclear engineers is certain to remain strong and is likely to increase substantially over the next decade, and nuclear engineering salaries are likely to remain very high relative to other engineering disciplines.

VII. Admission and Curriculum

A. Admission Criteria

The admission criteria are the same as those of the KSU Carl R. Ice College of Engineering.

B. Curriculum

Year 1: Fall **SCH = Semester Credit Hours**

Course #	Course Name	SCH
ME 212	Engineering Graphics	2
MATH 220	Analytic Geometry and Calculus I (KSC 030)	4
DEN 160	Engineering Orientation	1
DEN 161	Engineering Problem Solving	1
CHM 210	Chemistry I	4
ENGL 100	Expository Writing I (KSC 010)	3
	Total Hours	15

Year 1: Spring

Course #	Course Name	SCH
MATH 221	Analytic Geometry and Calculus II	4
PHYS 213	Engineering Physics I (KSC 040)	5
CHE 354	Basic Concepts in Materials Science and Engineering	1
CHE 355	Fundamentals of Mechanical Properties	1
COMM 106	Public Speaking (KSC 020)	3
ENGL 200	Expository Writing II (KSC 010)	3
	Total Hours	17

Year 2: Fall

Course #	Course Name	SCH
CIS 209	Computer Programming for Engineers (Python)	3
MATH 222	Analytic Geometry and Calculus III	4
PHYS 214	Engineering Physics II	5
NE 495	Elements of Nuclear Engineering	3
	Total Hours	15

Year 2: Spring

Course #	Course Name	SCH
	Social & Behavioral Sciences Requirement (KSC 050) *	3
MATH 340	Differential Equations	4
CE 333	Statics	3
ME 513	Thermodynamics	3
NE 415	Introduction to Engineering Analysis	3
	Total Hours	16

Year 3: Fall

Course #	Course Name	SCH
	Social & Behavioral Sciences Requirement (KSC 050) *	3
CE 533	Mechanics of Materials	3
ME 512	Dynamics	3
ECE 519	Electric Circuits for Engineers	3
NE 690	Radiation Protection and Shielding	3
	Total Hours	15

Year 3: Spring

Course #	Course Name	SCH
	Arts & Humanities Requirement (KSC 060) **	3
	Restricted Technical Elective ***	3
ME 571	Fluid Mechanics	3
NE 650	Nuclear Fuel Cycles +	3
NE 612	Principles of Radiation Detection	3
	Total Hours	15

Year 4: Fall

Course #	Course Name	SCH
ME 573	Heat Transfer	3

ME 574	Interdisciplinary Industrial Design Project I	3
NE 640	Nuclear Reactor Thermal Hydraulics	3
NE 630	Nuclear Reactor Theory	3
	Free Electives {Institutionally Designated Area} (KSC 070)	3
	Total Hours	15

Year 4: Spring

Course #	Course Name	SCH
	Arts & Humanities Requirement (KSC 060) **	3
NE 585	Nuclear Engineering Design Projects +	3
NE 648	Nuclear Reactor Laboratory	3
	Free Electives {Institutionally Designated Area} (KSC 070)	3
	Nuclear Engineering Elective ++	3
	Total Hours	15

* Any two courses meeting KSC-5 requirements may be taken
** Any two courses meeting KSC-6 requirements may be taken
*** Any course from the restricted elective list may be taken
\+ New course not yet in undergraduate catalog
++ Any course from the nuclear engineering elective list may be taken

Total Number of Semester Credit Hours ……. 123

To graduate with a Bachelor of Science in nuclear engineering, students must have a ≥ 2.200 GPA in all ME/NE classes ≥ 400 level taken for undergraduate credit at Kansas State University. Course grades that have been removed by the K-State Retake policy will not apply to this GPA calculation.

*****List of restricted electives**

- NE at or above the 300 level
- ME at or above the 500 level (except ME 519)
- BAE at or above the 200 level
- BME at or above the 200 level
- CE at or above the 200 level (except CE 202, CE 212, CE 530)
- CHE at or above the 200 level
- CIS at or above the 200 level
- ECE at or above the 200 level
- ENVE at or above the 200 level
- IMSE at or above the 200 level
- MATH at or above the 500 level
- CHM at or above the 230 level
- PHYS at or above the 325 level
- BIOL at or above the 190 level
- BIOCH at or above the 250 level
- STAT at or above the 500 level
- GEOL at or above the 360 level

++List of nuclear engineering electives

- NE at or above the 600 level
- ME 777: Monte Carlo Methods

- ME 760: Engineering Analysis I

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
Amir Bahadori *	Associate Professor	PhD	Y	Radiation Protection	0.1875
Ronnie Brockhoff	Teaching Associate Professor	PhD	N	Radiation Transport	0.25
Anna Iskhakova	Research Assistant Professor	PhD	N	Thermal Hydraulics Nuclear Fuels	0.125
Arsen Iskhakov	Assistant Professor	PhD	Y	Thermal Hydraulics	0.125
Douglas McGregor	University Distinguished Professor	PhD	Y	Radiation Detection Nuclear Materials	0.125
Walter McNeil	Associate Professor	PhD	Y	Radiation Detection Systems	0.125
Jeremy Roberts	Associate Professor	PhD	Y	Reactor Physics	0.4375

Number of graduate assistants assigned to this program ..... **1 (existing)**

IX. Expenditure and Funding Sources

A. EXPENDITURES	First FY	Second FY	Third FY
Personnel – Reassigned or Existing Positions			
Faculty	$ 147,000	$ 151,400	$ 155,900
Administrators *(other than instruction time)*	$ 0	$ 0	$ 0
Graduate Assistants	$ 25,000	$ 25,800	$ 26,500
Support Staff for Administration (*e.g., secretarial*)	$ 0	$ 0	$ 0
Fringe Benefits *(total for all groups)*	$ 52,000	$ 53,600	$ 55,200
Other Personnel Costs	$ 0	$ 0	$ 0
Total Existing Personnel Costs – Reassigned or Existing	$ 224,000	$ 230,800	$ 237,600
Personnel – New Positions			
Faculty	$ 0	$ 0	$ 0
Administrators *(other than instruction time)*	$ 0	$ 0	$ 0
Graduate Assistants	$ 0	$ 0	$ 0
Support Staff for Administration (*e.g., secretarial*)	$ 0	$ 0	$ 0
Fringe Benefits *(total for all groups)*	$ 0	$ 0	$ 0

Other Personnel Costs	$ 0	$ 0	$ 0
Total Existing Personnel Costs – New Positions	$ 0	$ 0	$ 0
Start-up Costs - One-Time Expenses			
Library/learning resources	$ 0	$ 0	$ 0
Equipment/Technology	$ 0	$ 0	$ 0
Physical Facilities: Construction or Renovation	$ 0	$ 0	$ 0
Other	$ 0	$ 0	$ 0
Total Start-up Costs	$ 0	$ 0	$ 0
Operating Costs – Recurring Expenses			
Supplies/Expenses	$ 0	$ 0	$ 0
Library/learning resources	$ 0	$ 0	$ 0
Equipment/Technology	$ 0	$ 0	$ 0
Travel	$ 0	$ 0	$ 0
Other	$ 0	$ 0	$ 0
Total Operating Costs	$ 0	$ 0	$ 0
GRAND TOTAL COSTS	$ 224,000	$ 230,800	$ 237,600

B. FUNDING SOURCES *(projected as appropriate)*	Current	First FY (New)	Second FY (New)	Third FY (New)
Tuition / State Funds		$ 216,000	$ 235,800	$ 257,100
Student Fees		$ 47,500	$ 49,400	$ 51,300
Other Sources		$ 0	$ 0	$ 0
GRAND TOTAL FUNDING		$ 263,500	$ 285,200	$ 308,400
C. Projected Surplus/Deficit (+/-) (Grand Total Funding *minus* Grand Total Costs)		$ 39,500	$ 54,400	$ 70,800

X. Expenditures and Funding Sources Explanations

A. Expenditures

Personnel – Reassigned or Existing Positions

The faculty members identified in Section VIII, Core Faculty, will contribute the stated fractional FTE to the program. The cost to the program was estimated by multiplying the salary and associated fringe for each faculty member by the stated fractional FTE. For Ronnie Brockhoff, this number was multiplied by 0.2 to account for the fact that NE 495, Elements of Nuclear Engineering, will be taken by both BS ME and BS NE students for the foreseeable future, and approximately 20% of the students each year are anticipated to be BS NE students. All current salaries were inflated by 3% per year to account for cost-of-living adjustments, including for AY 2025-2026. Fringe was estimated as 33% of salary.

One GTA with an AY 2025-2026 salary of $25,000 will be allocated to the program. This salary was inflated by 3% per year to account for cost-of-living adjustments. Fringe was estimated as 14% of salary for the GTA.

All values presented in the table were rounded to the nearest $100.

Personnel – New Positions

No new positions required for this program.

Start-up Costs – One-Time Expenses

No start-up costs required for this program.

Operating Costs – Recurring Expenses

No recurring expenses required for this program. Existing nuclear engineering laboratories are being maintained by the Alan Levin Department of Mechanical Engineering using departmental funds.

B. Revenue: Funding Sources

The AY 2024-2025 base tuition rate for undergraduate students at KSU is $341.42 per credit hour for in-state status and $919.65 per credit hour for out-of-state status (Kansas State University, 2024). Engineering fees are $105.60 per credit hour for both in-state and out-of-state students (Kansas State University, 2024). For the purposes of computing tuition revenue, we assume that 80% of BS NE students have in-state status while 20% of BS NE students have out-of-state status, roughly corresponding to data from the most recent KSU Carl R. Ice College of Engineering fact book (Kansas State University College of Engineering, 2024).

An inflation rate of 5% is applied to base tuition, including for AY 2025-2026, corresponding to recent historical trends (Kansas State University College of Engineering, 2024). Engineering fees have not changed in recent years and are conservatively assumed to remain constant through the first three years of the program.

C. Projected Surplus/Deficit

Even under conservative assumptions, the proposed program will be immediately profitable, with a growing profit margin over the first three years. The return-on-investment is projected to grow from 18% in the first year to 30% in the third year. The program is projected to be profitable with a minimum enrollment of about 70 students.

XI. References

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