UND PETROLEUM ENGINEERING

UNIVERSITY OF NORTH DAKOTA

UND's Department of Petroleum Eng Oil and gas research

2023-2024 Funding Application

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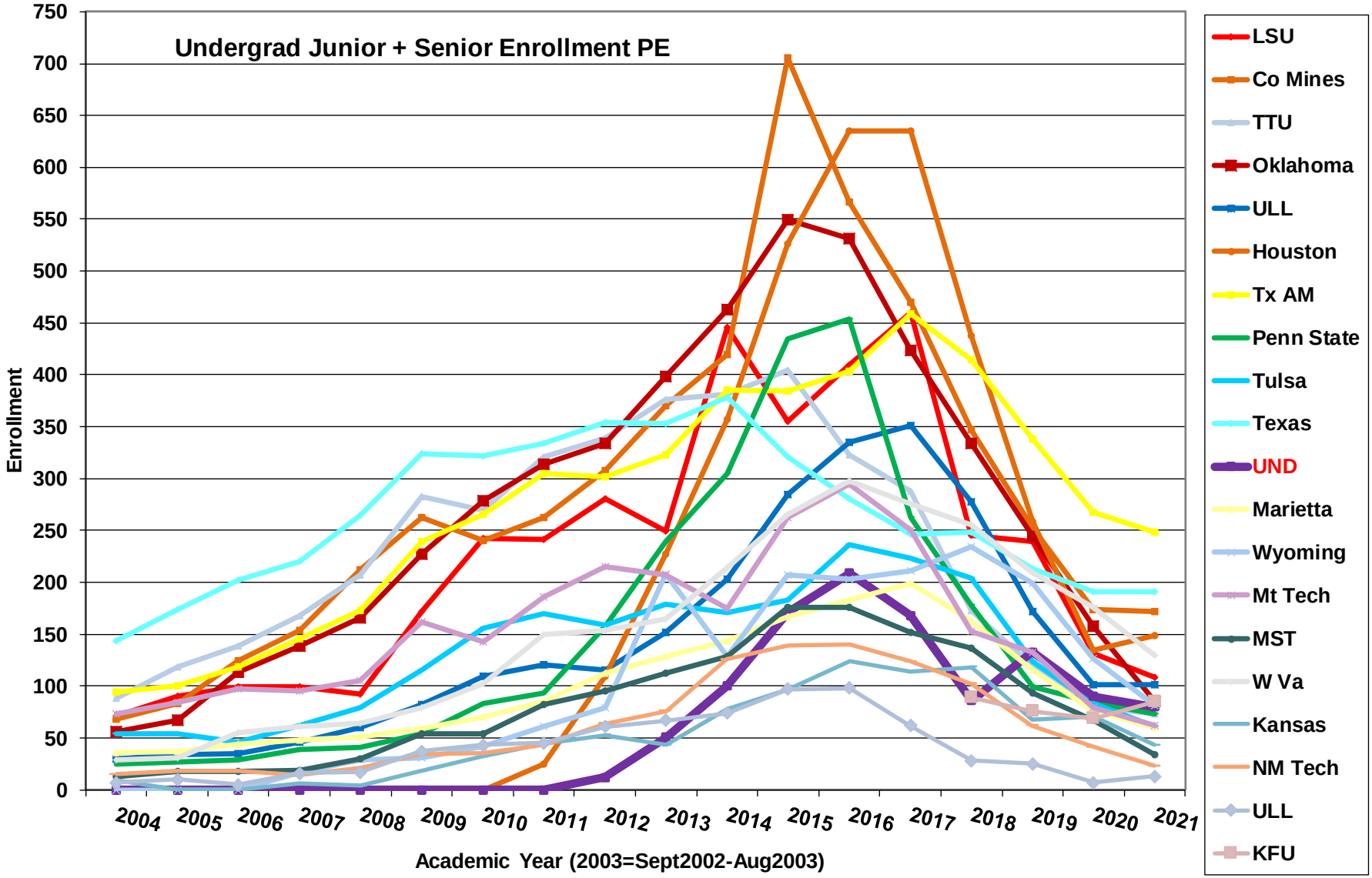
Petroleum Eng Department

Mission: Produce Hands on & Practical Petroleum Engineers who, upon graduation, can join the oil and gas workforce with minimum on job training needed

- Established in 2010
- Only PE program in ND
- Established to serve industry needs in Williston Basin, Bakken Oil Shale
- High job and internship placement
- Unconventional Shale Research

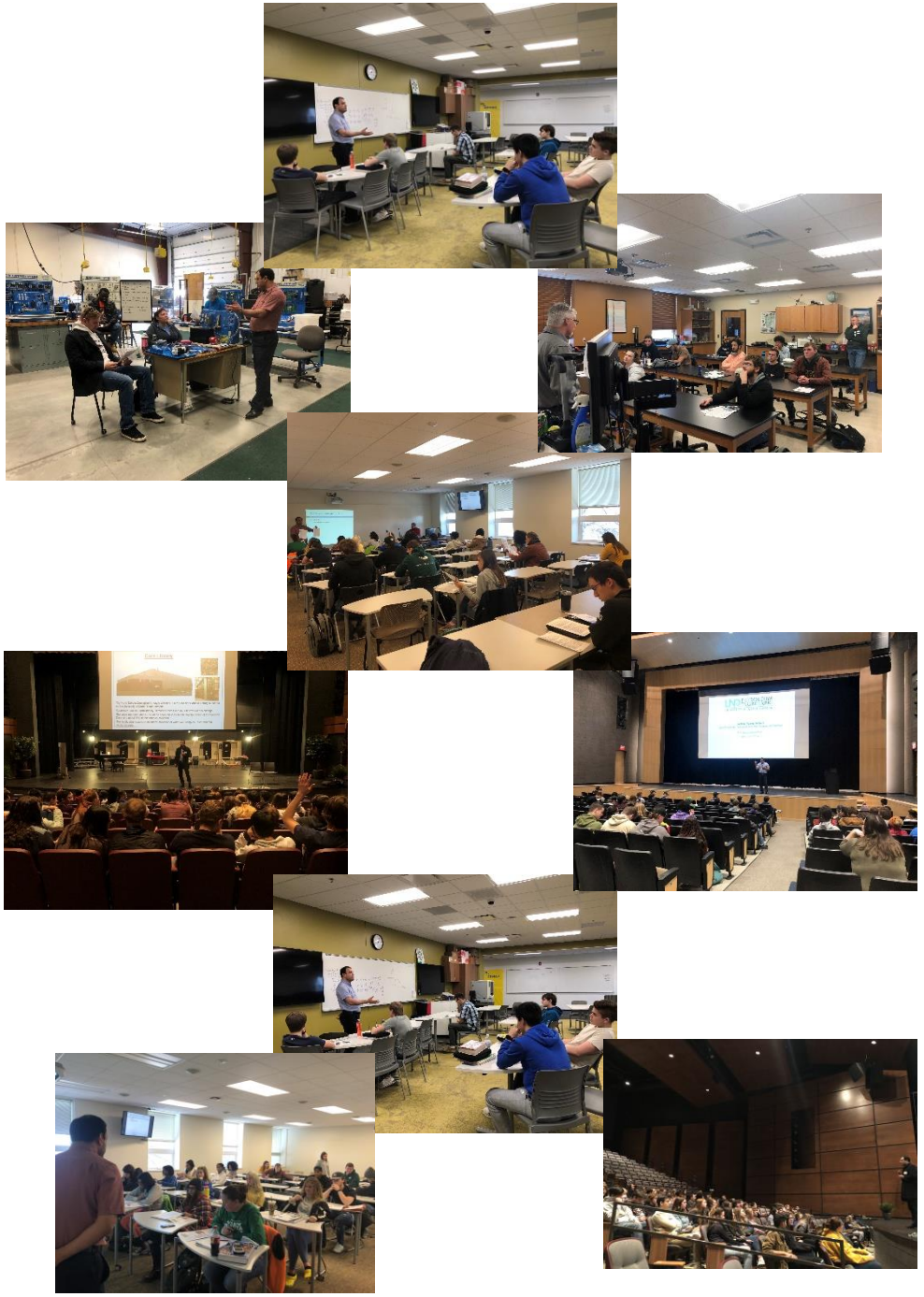
- 70 Undergrad students
- 100 Grad students, 70 of them Ph.D.
- On-campus & Online programs
- 7 full time faculty
- Advanced labs

Statistics (Fall 2021)



Outreach Efforts

- Williston State College, February 3
  - TECH 299, 4 students
  - CALC 3, 6 students
  - CHEM 122, 12 students
  - CALC 2, 20 students
  - PHYS 252, 13 students
- Williston High School, February 4
  - 85 students
- Watford City High School, February 4
  - Career Series for Junior class, 85 students
  - Level 2 Engineering, 6 students
  - Level 3 Engineering, 7 students



WSC 2+2 Program

FINISH IN 4 AT UND

When you begin your Petroleum Engineering degree at Williston State College

Plan of Study: Bachelor of Science in Petroleum Engineering

Begin courses at WSC		
First Year | First Semester		
	ENGL 110: Composition I	3
	MATH 165: Calculus I	4
	GEOL 105/L: Physical Geology with lab	4
	HIST 102: Western Civilization to 1500	3
	CHEM 121/L: General Chemistry I/Lab	4
	UNIV 100 or 101: College Strategies or College Transitions	1
	Total Credits	**19**
Apply to UND by April 15 • Complete online application at **UND.edu/transfer** • Request BSC transcripts to be sent to UND **here** (link at bottom of page) **Apply for scholarships at UND by March 1** • After admission submit application for campus-wide scholarships in UND's **Scholarship Central**		
First Year | Second Semester		
	PTRE 201: Introduction to Petroleum Engineering*** Possible sub	3
	MATH 166: Calculus II	4
	PHYS 251: University Physics I	4
	CHEM 122/L: General Chemistry II/Lab	4
	Wellness Course	2
	COMM 110: Public Speaking	3
	Total Credits	**20**
Take next steps to begin at UND • Begin new student checklist at **UND.edu/admitted** Attend UND Transfer Student Orientation at **UND.edu/orientation**		
Second Year | First Semester		
	ENGR 200: Computer Applications in Engineering	2
	MATH 265: Calculus III	4
	ENGL 130: College Composition: Writing for Public Audiences	3
	ENGR 201: Statics	3
	PTRE 301 Reservoir Rock Properties	3
	SOC 110: Introduction to Sociology	3
	Total Credits	**18**
Second Year | Second Semester		
	PTRE 311: Petroleum Fluid Properties	3
	MATH 266: Elementary Differential Equations	3
	ENGR 203: Mechanics of Materials	3
	ENGR 340: Professional Integrity in Engineering	3
	ME 341: Thermodynamics	3
	MUSC 100: Introduction to Music	3

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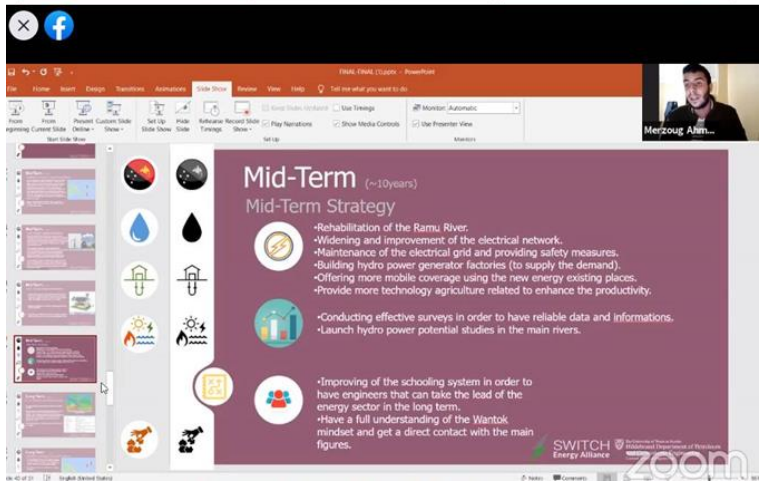
	Total Credits	**18**
Earn your WSC degree with Reverse Transfer (need to meet 62 credits) • See information and steps **here**		
Third Year | First Semester		
	PTRE 401: Well Logging	3
	PTRE 411: Drilling Engineering	3
	PTRE 431: Reservoir Engineering	3
	PHYS 252: University Physics II	4
	ME 306: Fluid Mechanics	4
	Total Credits	**17**
Third Year | Second Semester		
	PTRE 451: Advanced Drilling Engineering	3
	PTRE 445: Well Testing	3
	Technical Elective	3
	GEOL 407: Petroleum Geology	3
	Total Credits	**12**
Fourth Year | First Semester		
	PTRE 421: Production Engineering	3
	PTRE 465: Petroleum Geomechanics	3
	PTRE 471: Numerical Reservoir Simulation	3
	PTRE 484: Research Design	3
	PTRE 405: Petroleum Engineering Econ and Law	3
	Total Credits	**15**
Fourth Year | Second Semester		
	PTRE 485: Senior Design	3
	PTRE 475: Well Completions	3
	Technical Elective	3
	Choose one from the following: Math 321: Applied Statistical Methods OR CHE 315: Engineering Statistics and Design of Experiments	3
	Total Credits	**12**
Apply to graduate from UND *After registering for your last semester of courses, apply at* **UND.edu/commencement**		
Fourth Year | Summer Semester		
PTRE 361: Petroleum Engineering Lab I		**1**
PTRE 462: Petroleum Engineering Lab II		**1**
	Total Credits	**2**
	TOTAL CREDITS TO GRADUATE	**133**

UND UNIVERSITY OF NORTH DAKOTA LEADERS IN ACTION

Student Organizations, Activities and Awards

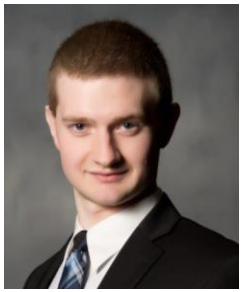
- Winners of the Spring 2021 DOE Geothermal Design Challenge

- 1st place in int Switch Energy Case Competition



- ARMA Student Design Competition 2021

- SPE Scholarship Recipients

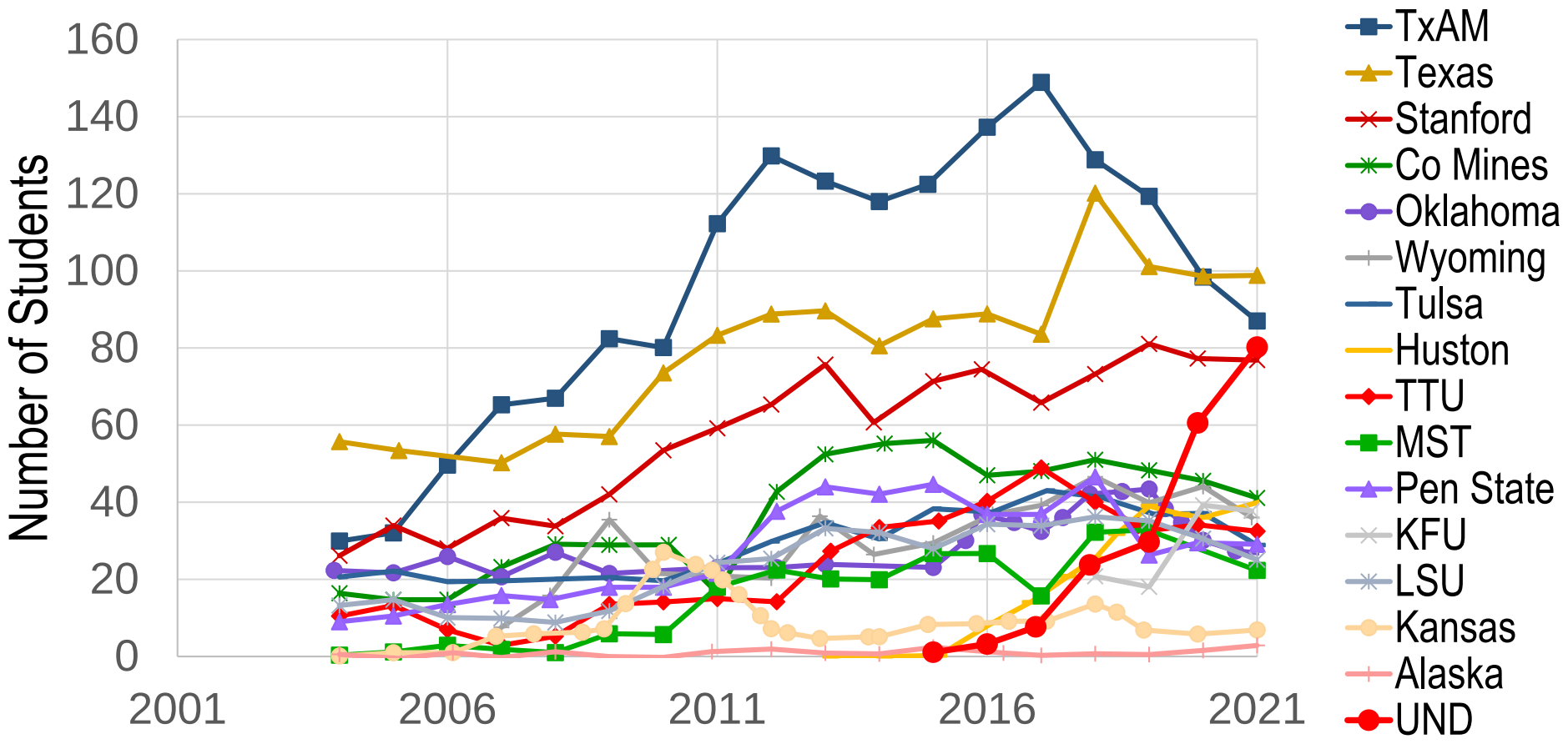


Nicholas Knapp

Joe Lindemann

Organized over 100 talks, workshops etc in 2021

UND PE PhD Enrolment Vs Other TOP PE Programs



PE Demographics as of Fall 2021

172 Student
27 Nationalities

Enrollment by Race/Ethnicity and Gender

Race/Ethnicity	Female	Male	Total
White	11	57	**68**
Two or more races	2	1	**3**
Race/Ethnicity Unknown		1	**1**
Non Resident Alien	15	59	**74**
Hispanic or Latino	3	9	**12**
Black or African American		9	**9**
Asian	1	3	**4**
American Indian or Alaska Native		1	**1**
Total	**32**	**140**	**172**

Enrollment by Age

Age	Headcount
18-19	5
20-21	8
22-24	23
25-29	39
30-34	34
35-39	30
40-49	22
50-64	10
65 & Over	1
Total	**172**

Enrollment by Academic Level

Level	Headcount
Freshmen	5
Sophomore	12
Junior	16
Senior	45
Graduate	94
Total	**172**

Enrollment by Program Type and Enrollment Status

Delivery	Headcount
On-campus	**94**
Full-Time	81
Part-Time	13
Online	**78**
Part-Time	49
Full-Time	29
Total	**172**

USA	Algeria	Nigeria	China	Columbia	India	Ghana
Cote D'Ivoire	Ecuador	Egypt	Iraq	Libyan Arab J		Mali
Indonisia	Camron	Iran	Bangladesh	Brazil	Canada	Congo DR
Nepal	Pakistan	Peru	Tunisia	UK	Uzbakistan	Viet Nam

Examples of Labs

Geomechanics Labs

DrillSim-5000

Virtual Reality

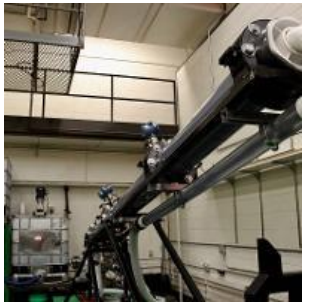
Reservoir Characterization

Multiphase Flow Labs

Pipeline Flow Simulations

Drilling Fluids Labs

Automated Drilling



Hole Cleaning Simulations

Full-Scale Drilling And Completion Lab (DRACOLA)

This is Schlumberger's field scale drill lab donated to Petroleum Engineering in 2019 and is being installed in 17,000sq.ft lab in Grand Forks. This equipment allows us to run real scale drilling to test bit performances, estimate rock properties and many other functions, in addition to providing new engineers with training they need before working in the field.

Full-Scale Drilling And Completion Lab (DRACOLA)

Publications (Fall 2021)

		Published in the most recent year (12 month timespan)			Taken From Dr. Heinze reporting		Journals/Faculty
SCHOOL	Timeframe	Journal	Conference	# Research faculty	MS	PhD	
University of Alaska	Academic 2020-2021	4**	6**	5	11	2	0.80
Colorado School of Mines	Calendar 2020	29	35	8	25	32	3.63
University of Houston	Calendar 2021	32	18	13	46	54	2.46
University of Kansas	Academic 2020-2021	22	11	5	9	11	4.40
Louisiana State University	Calendar 2020	33	24	13	13	22	2.54
Missouri S&T	Academic 2020-2021	25	8	4	8	16	6.25
Montana Tech	Calendar 2020	1	0	5	2	2	0.20
New Mexico Tech	Sept 2020-Aug 2021	16	5	5	13	11	3.20
Oklahoma State University		NR	NR	5	8	10	
University of Oklahoma	Calendar 2020	84	62	15.7	67	24	5.36
Pennsylvania State University		32	15	13.5	5	22	2.37
Stanford University		NR	NR	12	19	76	
Texas A&M University	Calendar 2020	35	89	25	69	73	1.40
University of Texas at Austin	Academic 2020-2021	136	109	21	49	109	6.48
Texas Tech University	Calendar 2020	36	17	9	28	25	4.00
University of Tulsa	Academic 2020-2021	53	23	8	18	16	6.63
University of North Dakota	Academic 2020-2021	47	14	6	21	79	7.83
University of Southern California	Academic 2020-2021	27	31	5	20	16	5.40
University of Louisiana Lafayette	Academic 2020-2021	31	3	6	10	15	5.17
West Virginia University		5**	3**	6	13	17	0.83
University of Wyoming	Academic 2020-2021	52	1	8	6	43	6.50

Current NDIC Fund for UND PE Program (March 2020- March 2023)

Item	Total Budget
15 Ph.D. students' tuition, stipend, other supports	1,530,000
6 faculty on- month summer salaries each year	288,000
DRACOLA Support	970,000
TOTAL	2,788,000

Products

- Top 3 largest PE Ph.D. programs in the USA
- Largest number of journal publications per faculty in PE programs in USA
- ABET Accreditation Strengths for Strong collaboration with State and industry and Establishment of DRACOLA
- 2021 API group achievement award and several students prizes
- Nearly 30 of past and current students worked part/full time at EERC

Proposed Project by NDIC for PhD Students

1. Big Data Analytics/UAS/Data Mining
2. CO_2-EOR
3. Sulfate Deposition
4. Machine Learning/Refracking
5. Real-time Leak Detection for Oil and Gas Pipelines in North Dakota
6. Oil and Gas Pipe Blockage Prevention and Detection Based on Operational Parameters
7. Prediction of Gas Hydrate to Improve North Dakota Oil and Gas Production Efficiency
8. Investigation of Multiphase Flow in Undulating Horizontal Wells to Enhance Bakken Oil Production
9. Light Hydrocarbon Injection to Enhance Bakken Tight Oil Recovery
10. Optimization of Multistage Fracturing in Horizontal Wells to Maximize Bakken Oil Recovery
11. Evaluation of Bakken Rock Properties Alternation Caused by CO2 Enhanced Oil Recovery
12. Feasibility Study of Water-Alternating-Gas Flooding in Bakken Reservoirs
13. Management and Treatment of Oil-Field Produced Water to Reduce Overall Cost, Bakken Case
14. Identification and Shut-off of Water Influx to Reduce Bakken Water Production
15. Frac-Hit Prediction, Prevention, and Mitigation for Bakken Pad Drilling and Stimulation
16. Study of Advanced Technologies to Reduce Gas Flaring in Bakken
17. Miscible EOR (CO2, rich gas) and Conformance Control in Miscible EOR
18. Reservoir Modeling and Simulation
19. Wettability Determination and Imbibition Experiments
20. CO2 Storage
21. Fluid Flow Mechanisms in Tight Formation
22. Saltwater Disposal and Its Optimization

Funding Request for 2 Years

Item	Total Budget
30 Ph.D. students' tuition, stipend, other supports	2,400,000
7 faculty on- month summer salaries each year @ $20k/month/faculty	280,000
DRACOLA Support (Automation & Data Hub)	300,000
TOTAL	2,980,000

Cost Share

Company	Total ($)
SimTech: Technical advice and software license provision	1,430,000
Bumpa's Consulting (Technical support for operation of DRACOLA)	90,000
Schmidt Mgm (Electrical Support of DRACOLA)	75,000
ResFrac (Software support)	82,500
Itasca Consulting Group: Technical advice and software license provision	1,827,630
Nabors Drilling (donation of BOP and technical advice)	128,800
TOTAL	3,633,930

Thank you for supporting UND PE Program