

## DEPARTMENT OF PHYSICS

### Mission

The Department of Physics promotes the advancement, dissemination and applications of knowledge and understanding of the fundamental laws of nature through quality research, teaching and outreach.

### Vision

The Department of Physics will achieve substantial growth in its nationally and internationally recognized research programs and in the quality of its undergraduate and graduate education programs.

### Core Values

**Excellence** – We seek excellence in all our endeavors, and we are committed to continuous improvement. We are committed to outstanding research, scholarly and creative activity, and effective high-quality teaching.

**Integrity** – We are committed to the principles of truth and honesty, and we will be equitable, ethical, and professional.

**Diversity** – We respect others and value diversity of opinions, freedom of expression, and other ethnic and cultural backgrounds. We are committed to promoting greater diversity in the College.

**Collegiality** – We strive to maintain an atmosphere of mutual help and support.

**Intellectual Freedom** – We believe in ethical and scholarly questioning in an environment that respects the rights of all to freely pursue knowledge. We are committed to academic freedom.

**Service** – We believe that serving others is a noble and worthy endeavor.

**Stewardship of Resources** – We are dedicated to the efficient and effective use of resources. We accept the responsibility of the public's trust and are accountable for our actions.

## Goals, Critical Success Factors, Objectives, and Strategies

**Goal 1: Foster an environment for our world class faculty that continues to promote the development and growth of forefront research programs with national and international prominence.**

### **Critical Success Factors:**

- Twenty five (25) tenured and tenure-track faculty members
- Given our increased size, we will obtain \$ 4,000,000 per year in external funds
- Start-up funds for new hires to \$500,000
- Given our increased size, we will provide six (6) more courses for our students
- Renovate two (2) research labs for physics faculty
- Two (2) new Endowed Chairs
- Make average faculty salaries in physics equal to the Big Twelve average
- Outstanding faculty members receive special raises substantially (about 20%) above merit raises
- Two (2) annual endowed lectureships for our colloquium series

### ***Objectives:***

**Objective 1.1:** Increase the number of faculty in the Department.

#### Strategies:

- Work with the University and A&S Development Officer to create two more endowed chaired positions.
- Create three junior tenure-track faculty positions from the retirements/administrative advancements of two senior faculty professors.
- Develop and submit proposals for implementation/infrastructure improvement to create new faculty lines.

**Objective 1.2:** Increase the external funding level.

#### Strategies:

- Increase the number of submitted grant proposals.
- Promote faculty visits to granting agencies to discuss research proposals.
- Establish collaborative interdisciplinary research programs with other departments and colleges.
- Tap into well funded research growth areas.

**Objective 1.3:** Increase start-up funds and facilities for new faculty hires.

Strategies:

- Utilize increased IDC funds within our department to increase start-up funds.
- Include start-up funds for new faculty through submission of implementation/infrastructure improvement grant proposals.
- Work with A&S development officer in visiting Research Foundations to improve the start-up funds for faculty chair positions.

**Objective 1.4:** Creation, expansion, and improvement of vital research areas.

Strategies:

- Recruit faculty in research fields deemed important by the physics faculty including well-funded research areas.
- Establish collaborative interdisciplinary research programs with other departments and colleges.
- Obtain funds for new and improved laboratory facilities through the submission of implementation/infrastructure improvement grant proposals.

**Objective 1.5:** Revise existing courses and develop new courses for our students.

Strategies:

- With additional faculty, increase the number of upper level undergraduate courses and specialized graduate courses.
- Revise and implement courses for science/physics majors.
- Develop new interdisciplinary courses which include students from other departments.

**Objective 1.6:** Retain Physics faculty.

Strategies:

- Create faculty fellows through foundation programs (e.g., Noble Research Fellows).
- Work with A&S Dean's office for special raises for outstanding faculty.
- Work with A&S Dean's office to improve faculty salaries through the implementation of a yearly raise program.
- Improve spousal accommodation for faculty members.

**Objective 1.7:** Improve research infrastructure.

Strategies:

- Submit infrastructure and facilities grant proposals to federal, state and private agencies.
- Visit research foundations and private enterprises to assist in creating new research centers.

**Objective 1.8:** Create new endowed lectureships.

Strategies:

- Work with A&S development officer for obtaining endowed lectureships.
- Visit foundations and private enterprises to determine interest in funding endowed lectureships.

**Objective 1.9:** Provide research and teaching aids for new faculty.

Strategies:

- Senior tenured faculty provides mentoring for new faculty hires.
- Include new faculty in large research proposals.
- Limit the number of committee assignments for new faculty.
- Make funds available for new faculty to participate at research and teaching conferences and to visit granting agencies.

**Goal 2: Enhance university, national, and international visibility of the Department of Physics teaching and research programs.**

**Critical Success Factors:**

- Increase the number of faculty receiving awards for scholarship and teaching
- Increase faculty service in professional organizations and funding agencies
- Increase the number of journal publications and conference/meeting presentations by 20%
- Enhance number of invited talks by 20 %
- Continue having our outstanding students receive scholarships and fellowships (e.g., Niblack, Goldwater, Truman, NSF Graduate Research Fellowships)

**Objectives:**

**Objective 2.1:** Increase the number of physics faculty receiving university and national society research and teaching awards and fellowships.

Strategies:

- Nominate young faculty for career, young investigator, and Dreyfuss awards.
- Nominate faculty for Regents' professorships.
- Continue nominating faculty for teaching & research awards (e.g., Regents Distinguished awards, American Association of Physics Teachers Teaching Awards, Searle, Sigma Xi lectureships).

**Objective 2.2:** Increase faculty participation in national and international professional organizations.

Strategies:

- Nominate faculty for fellow status in the National Societies.
- Promote faculty in panel reviews at granting agencies.
- Promote faculty participation on editorial boards for physics journals.

**Objective 2.3:** Improve the national and international visibility of the Department.

Strategies:

- Institute departmental promotion at invited talks and colloquia.
- Promote research activities and degree programs at national and international meetings (via poster display).
- Promote interdisciplinary research collaborations with physics faculty.

- Update web site on honors obtained by faculty, students and staff (fellows, scholarships, funding awards, etc.).
- Revise and submit documents for recruiting both US and international students to our program.
- Reintroduce the publication of a yearly Physics newsletter.
- Provide assistance to faculty for web site development.

**Goal 3: Recruit, educate and retain an outstanding and diverse student body.**

**Critical Success Factors:**

- Increase by 20% the number of undergraduate physics majors/minors
- Increase the number of minority and female physics majors
- Increase the number of physics majors and minors by recruiting 2% of the students in our engineering physics courses
- Increase the number of students receiving scholarships and fellowships
- Increase to 60 the number of graduate students
- Increase the Graduate Assistantship Salary to \$ 1800/month
- Increase the number of minority and female physics graduate students

**Objectives:**

**Objective 3.1:** Increase the number and amount of scholarships and fellowships.

Strategies:

- Improve web searches for students and advisors through the purchase of newer computers.
- Give presentations to students on availability and application procedures for research fellowships and scholarships.
- Promote and assist students in applying for university and national scholarships and fellowships.
- Seek outside funding to increase our undergraduate departmental scholarships (currently Daniel Stevens Scholarships supports up to eight undergraduate students, Elton Kohnke Scholarships support three undergraduate students, and the Earl Lafon Scholarship supports one undergraduate).

**Objective 3.2:** Continue activities and clubs for students.

Strategies:

- Expand Society of Physics Students activities (e.g., include a reorganized astronomy program).
- Continue the NSF Research Experience for Undergraduates Program.
- Continue faculty supervision of OSU activities (the Running Club, the Nepalese Student Association, and the Friendship Association of Chinese Students and Scholars).

**Objective 3.3:** Increase the recognition and retention of outstanding students.

Strategies:

- Continue and expand on awards recognizing outstanding scholarship and service.
- Promote research for undergraduates with faculty.
- Photo identification and short resume of undergraduates and graduates on picture board and on Physics web site.
- Encourage Physics majors to take Honors courses and credits.
- Create wall of excellence outside of department office which lists outstanding achievements of our students (Niblack, Goldwater, Wentz scholar winners, etc.).
- Nominate outstanding undergraduate students for membership in Sigma Pi Sigma (Physics Honor Society).

**Objective 3.4:** Recruit a diverse and outstanding student body.

Strategies:

- Publicize our outstanding research and teaching programs through updates in our web site, newsletter, recruiting pamphlets.
- Tracking and determining the number of undergrad physics majors and minors.
- Involve all Physics faculty in mentoring our undergraduate majors.
- Visit high schools giving presentations (e.g., PowerPoint) on reasons for attending OSU and for being physics majors.
- Have Society of Physics Students members accompany faculty during recruiting trips to Oklahoma High Schools.
- Have faculty become mentors for students involved with OK-LSAMP (Oklahoma Louis Stokes Alliance for Minority Participation in Science, Technology, Engineering, and Mathematics) and for the next submission of the NSF Alliances for Graduate Education and the Professoriate (AGEP) proposal, GANN and other NSF and Department of Education proposals.
- Continue the NSF Research Experience for Undergraduates Program.
- Visit minority institutions (e.g., Comanche Nation College, Langston University) to recruit undergraduate and graduate students into our physics programs.
- Develop research programs with minority institutions to recruit graduate students into our physics program.
- Use and update physics web site, newsletter, and recruiting documents to improve visibility of our department.



**Goal 4: Maximize effective use of new technological and pedagogical approaches to physics teaching programs.****Critical Success Factors:**

- Implement and evaluate personal response systems in four high enrollment introductory physics and astronomy courses.
- Increase student comprehension of elementary physics concepts by 20% (using Force Concept Inventory).
- Renovate two classrooms to improve teaching methods for all participating students.
- Increase the number of available physics demonstrations for lower level physics courses by 20%.

**Objectives:**

**Objective 4.1:** Improve material and classroom environments for select physics and astronomy courses.

## Strategies:

- Modernize classrooms to include state-of-the-art teaching technologies.
- Make classrooms more handicap accessible.
- Develop undergraduate studio laboratories for selected introductory physics courses.
- Simplify Frontier Physics course, including more historical background in physics and new and exciting fields of research.
- Offer elective physics courses for physics majors in both spring and fall semesters.
- Create a computer room for physics majors which includes modern software packages and languages.
- Implement personal response devices for introductory physics and astronomy courses.
- Write proposals to obtain funds for improving teaching preparation room and demonstrations.
- Request funds for a quarter-time teaching assistant to prepare demonstrations for lower level physics courses.
- Implement computer simulations in teaching undergraduate physics courses.
- Review and revise safety procedures for all undergraduate teaching laboratories and the astronomy observatory.

**Objective 4.2:** Implement innovative teaching methods.

## Strategies:

- Use hypothesis based learning techniques in selected physics courses.

- Develop faculty and graduate student teaching effectiveness through peer interaction and input.
- Implement and evaluate different pedagogical teaching methods (e.g., inquiry based physics method) for selected physics courses.
- Implement and evaluate the use of web homework assignments and grading for selected physics classes.
- Use pre/post tests for evaluation of teaching methods.
- Implement personal response systems for introductory physics and astronomy courses.
- Utilize force concept inventory for courses containing introductory mechanics concepts to assess and improve class test scores.
- Invite outside speakers who specialize in teaching methods to give departmental colloquia and seminars.
- Utilize on-line compilations of teaching resources.

**Goal 5: Create an environment that stimulates enhanced faculty and staff effectiveness.**

**Critical Success Factors:**

- Continue to practice collegiality.
- Raise staff salaries.
- Renovate physics office and seminar room to improve working environment.
- Meet safety requirements in all research and teaching laboratories.

**Objectives:**

**Objective 5.1:** Maintain collegiality among faculty and staff.

Strategies:

- Acknowledgements for faculty and staff in newsletter, meeting presentations and publications.
- Encourage attendance of faculty, staff and students at holiday celebrations, and picnics.
- Provide faculty and Staff awards at banquets.
- Encourage the continuation of courses taken by office staff members.
- Provide mentoring for new staff hires.
- Convey appreciation for faculty and staff.
- Create wall of excellence outside of department office which lists outstanding achievements of our faculty and staff.

**Objective 5.2:** Improve working environment for faculty and staff.

Strategies:

- Improve environments of offices and laboratories (carpet, computers, desks, air handling).
- Renovate seminar room to include improved appearance, lighting, and projection system for presentations.
- Implement new safety features in the research laboratories.
- Work with departmental safety officer to improve all other safety aspects within the department.
- Work with the OSU Compliance Office on up-to-date safety issues and requirements (laser, radiation, chemical).
- Continue to update chemical inventories and material safety data sheets in all research and teaching laboratories.

- Continue to provide release time for faculty, students and staff to complete any needed safety programs.
- Provide opportunities for faculty and staff development through programs administered from the Office of Human Resources (e.g., training workshops, seminars on multicultural sensitivity, etc.; charges and fees paid for by the department).
- Allow release time for staff to participate in off campus training and meetings, such as the Bradshaw Software Seminar in Tulsa, OK (charges and fees paid for by the department).

**Goal 6: Economic Development ---enhance the quality of life in Oklahoma through the development of research partnerships and collaborations with high tech companies.**

**Critical Success Factors:**

- Have at least one faculty with laboratories at Oklahoma Technology and Research Park.
- Establish two student internships with Oklahoma Companies.
- Establish two faculty internships with Oklahoma Companies.
- Continue successful faculty interactions with Oklahoma Companies.

**Objectives:**

**Objective 6.1:** Increase the number of faculty participating in the Oklahoma Technology and Research Park (OTRP) and Oklahoma Companies.

Strategies:

- Hire one junior level faculty member to work on laboratory relocated in OTRC.
- Submit proposals which provide funding for faculty to intern at OTRC and other Oklahoma companies.
- Continue submission of Small Business Innovation Research and Small Business Technology Transfer Programs (SBIR/STTR) proposals between physics faculty and Oklahoma Companies.

**Objective 6.2:** Establish student internships with Oklahoma Companies.

Strategies:

- Write proposals to provide funds for student internships with Oklahoma companies.
- Continue submission of SBIR/STTR proposals with Oklahoma Companies which involves student participation.

**Objective 6.3:** Education improvement for office staff.

Strategies:

- Provide release time for staff to take courses at OSU.

**Objective 6.4:** Outreach for K-12 students and the Oklahoma Public.

Strategies:

- Continue and promote tours of our research facilities, including offsite facilities such as our observatory and Venture One Building.

- Perform demonstrations at Oklahoma schools to discuss physics principles and their every-day applications in life.
- Public outreach lectures to demonstrate how physics research improves the quality of life for people in Oklahoma (e.g., Lion's Club, Rotary Club).