Ball State University
Department of Physics and Astronomy
Teaching Major in Physics
or
Physical Science
(Physics Concentration Area)

STUDENT HANDBOOK
September 2007

This handbook is for students who are seeking a **teaching license** in **Physics or Physical Science (Physics Concentration)** in the senior high school or both the senior high and middle school/junior high school. Specific program information is in the Ball State University Undergraduate Catalog.

Please note that this handbook is advisory only. It is your responsibility to meet all the requirements listed in the Undergraduate Catalog and on your DAPR.

Physics and Astronomy Department Advisors:

When you have questions about your program, contact your academic advisor and/or the Physics and Astronomy Department Office. The departmental office is located in the Cooper Science Building, CP 101, and can be reached by calling 765-285-8860.

Get in the habit of meeting regularly with your Physics and Astronomy Department academic advisor at least once a semester.

Following is a list of departmental advisors for the teaching major programs:

Dr. Joel Bryan
Dr. Ronald Cosby
Dr. Thomas Jordan
Dr. Thomas Robertson

Department of Physics and Astronomy - Effective August 2002
Physical Science (Physics Emphasis) and Physics Teacher Certification Decision Points

Decision Point #	1	2	3	4
Proposed Time	End of "1st" year	End of "2nd" year	Term prior to student teaching	End of "last" term
Significance/Rationale	Initial identification with Teacher Education Program	Admission to Teacher Education Program; take 200 level Teacher Education Courses	Ready to student teach	Recommended for licensure
Teacher Education Requirements	SCI 150, Grade "C" or better	EDMUL 205, EDPSY 251	SCI 395, 396, EDSEC 380, EDPSY 290 EDFON 420,EDJHM 385	EDSEC 460, EDJHM 460
Content Requirements (Courses)	PHYCS 120 and 122 MATHS 165 and 166	PHYCS 260, 262, and 330	PHYCS 340, 354, and 434	Completed PHYCS 450 and Research
Other Requirements: Standardized exams and grades	ETS AP exam score of 3 or more on Mechanics (PHYCS 120) exam; "C" or better in above courses	ETS AP exam score of 3 or more on Electromagnetic Theory (PHYCS 122) exam; "C" or better in above courses	Overall GPA of 2.5 or more. "C" or better in above courses.	Overall GPA of 2.5 or more. "C" or better in above courses.
Content Portfolio (all artifacts should include both the student work and the instructor's assessment document/rubric and class averages) (Minimum Requirements)	1. Final exam from MATHS 165 and 166 2. Final exam from PHYCS 120 and 122 3. One lab report from PHYCS 120 and 122 4. Reflective statement regarding progress in course work and continued interest in teaching	1. Representative exams from PHYCS 260 and 330 2. Three PHYCS 262 Laboratory Experiments 3. Reflective statement regarding progress in content area	1. Two final exams from PHYCS 340, 354, or 434 2. Copy or video tape of demonstrations presented in SCI 395, 396 or physics classes 3. Evidence of completed research or creative project and copies of any PowerPoint presentations. 4. Reflective statement regarding progress in physical science.	
Standards of importance for the presentation and evaluation of the Content Portfolio (See Appendix C of IPSB Standards Document)	1. The properties of matter 2. The relationships between force and motion 3. The nature of energy 4. Momentum and energy	1. The nature of electricity and magnetism 2. The behavior of waves 3. The laws of thermodynamics	1. The nature of atomic and subatomic physics 2. The nature of thermal physics and statistical mechanics 3. The behavior of analog and digital circuits	
Evaluation (assessment) of content portfolio (2-3 person committee assigned by Physics Department) Rankings: **Unsatisfactory** -disorganized approach to problem solving, numerous uncorrected content area errors. **Basic** - few content errors, knowledge and concepts not integrated **Proficient** - solid and integrated knowledge **Distinguished** - solid and integrated knowledge with evidence of continued learning	1. Evidence of abilities to organize and present portfolio items. 2. Evidence of progress in problem solving and writing skills. 3. Evidence of ability to use computers to acquire and present data. 4. Evidence of an ability to respond to oral questions such as: where do you think you made the most progress this year? Problem solving? Writing? Understanding principles? Integrating basic principles and concepts?	1. Evidence of abilities to organize and present portfolio items. 2. Evidence of progress in problem solving and writing skills. 3. Evidence of ability to use computers to acquire and present data. 4. Evidence of an ability to respond to oral questions such as: where do you think you made the most progress this year? Problem solving? Writing? Understanding principles? Integrating basic principles and concepts?	1. Evidence of abilities to organize and present portfolio items. 2. Evidence of progress in problem solving and writing skills. 3. Evidence of abilities to carry out a research project and keep detailed records. 4. Evidence of abilities to use technology to present information. 5. Evidence of being able to describe complex phenomena and/or processes for solving complex problems in PHYCS 340, 354, 434.	

Physical Science Certification—4 yr

BALL STATE UNIVERSITY
TEACHING MAJOR IN PHYSICAL SCIENCE - 56-57 hrs

This is a four-year program that will meet the high school chemistry and physics certification standards of Indiana.

COMMON CORE, 41 hrs

CHEM 111	Gen Chem 1	4
CHEM 112	Gen Chem 2	4
CHEM 225	Analysis	3
CHEM 231	Organic 1	4
MATHS 165	Calculus 1	4
MATHS 166	Calculus 2	4
PHYCS 120	Gen Phycs 1	5
PHYCS 122	Gen Phycs 2	5
PHYCS 260	Intro Modern	4
PHYCS 262	Modern Lab	1
RESEARCH	(HONRS THESIS, INTERNSHIP, OR DEPT. RES)	3
	Total	41

STUDENTS MUST COMPLETE THE HIGH SCHOOL CHEMISTRY or PHYSICS CONCENTRATION AREA, OR FOLLOW THE GUIDELINES OUTLINED IN SECTION III.

I: High School Chemistry Concentration

CHEM 232	Organic 2	4
CHEM 344	Physl Chem I	4
CHEM 450	Inorg Chem	4
CHEM 463	Prn Biochm 1	3
	Total	15

II: **High School Physics Concentration**

PHYCS 330	Mechanics	3
PHYCS 340	Physcl Optic	3
PHYCS 354	Electronic 1	4
PHYCS 434	Thermodynamc	3
PHYCS 450	Elect Magnet	3
	Total	16

III: Students who currently hold or are pursuing a license in one of the following areas will not be required to complete the High School Chemistry or Physics Concentration area in Section 1 or 2 above.

A. SECONDARY LIFE SCIENCE CERTIFICATION
B. SECONDARY EARTH/SPACE SCIENCE CERTIFICATION
C. SECONDARY MATHEMATICS CERTIFICATION

Eight Semester Student Schedule for **Physical Science Teaching Major** (**H.S. Physics Option – 4 year program**)

Undergraduate majors only. This is to be a sample student program to include UCC, program and elective courses. The hours for each semester should be subtotaled with the total for the entire course of study listed in the bottom right hand corner. Specific UCC and elective courses should not be listed. They should be identified generally [i.e. UCC (3 or 2 hrs.) or elec. (3 - 1hr)]

FALL

FRESHMAN

Course	Hrs
Chem 111	4
Maths 165	4
Phycs 120	5
Sci 150	3
Sub Total	16

SOPHOMORE

Course	Hrs
Chem 231	4
Phycs 260	4
UCC	3
Edpsy 251	3
Edmul 205	3
Sub Total	17

JUNIOR

Course	Hrs
Phycs 354	4
Phycs 450	3
UCC	3
UCC	3
UCC	3
Sub Total	16

SENIOR

Course	Hrs
Research	3
Edjhm 385	3
Edsec 380	3
Sci 396	3
UCC	3
UCC	3
Sub Total	18

SPRING

FRESHMAN

Course	Hrs
Chem 112	4
Maths 166	4
Phycs 122	5
UCC	3
Sub Total	16

SOPHOMORE

Course	Hrs
Chem 225	3
Phycs 262	1
Phycs 330	3
UCC	3
UCC	3
UCC	3
Sub Total	16

JUNIOR

Course	Hrs
Phycs 340	3
Phycs 434	3
UCC	3
UCC	2
Sci 395	3
Edfon 420	3
Sub Total	17

SENIOR

Course	Hrs
Edsec 460	6
Edjhm 460	6
Sub Total	12

Grand Total 128 Hrs

Physical Science Certification — 4½ yr

BALL STATE UNIVERSITY
TEACHING MAJOR IN PHYSICAL SCIENCE—74-75 hrs

This is a four and one-half year program that will meet the physical science (middle school science and high school chemistry and physics) certification standards of Indiana. The high school science and mathematics concentration areas will likely take more than four years.

COMMON CORE - 59 hrs

ASTRO 120	STARS STEL SYS	3
ASTRO 121	HONRS ASTR LAB	1
BIO 111	PRINC BIO 1	4
BIO 112	PRINC BIO 2	4
GEOL 102	EARTH TIME (3 hr)	3
GEOG 230	ELM METEOR (3 hr)	3
		18 hrs

CHEM 111	Gen Chem 1	4
CHEM 112	Gen Chem 2	4
CHEM 225	Analysis	3
CHEM 231	Organic 1	4
MATHS 165	Calculus 1	4
MATHS 166	Calculus 2	4
PHYCS 120	Gen Phycs 1	5
PHYCS 122	Gen Phycs 2	5
PHYCS 260	Intro Modern	4
PHYCS 262	Modern Lab	1
RESEARCH	(HONRS THESIS, INTERNSHIP, OR DEPT. RES)	3
		41 hrs

Common Core Total 59 hrs

STUDENTS MUST COMPLETE THE HIGH SCHOOL CHEMISTRY or PHYSICS CONCENTRATION AREA, OR FOLLOW THE GUIDELINES OUTLINED IN SECTION III.

I: High School Chemistry Concentration

CHEM 232	Organic 2	4
CHEM 344	Physl Chem I	4
CHEM 450	Inorg Chem	4
CHEM 463	Prn Biochm 1	3
	Total	15

II: **High School Physics Concentration**

PHYCS 330	Mechanics	3
PHYCS 340	Physcl Optic	3
PHYCS 354	Electronic 1	4
PHYCS 434	Thermodynamc	3
PHYCS 450	Elect Magnet	3
	Total	16

III: Students who currently hold or are pursuing a license in one of the following areas will not be required to complete the High School Chemistry or Physics Concentration area in Section 1 or 2 above.

A. SECONDARY LIFE SCIENCE CERTIFICATION
B. SECONDARY EARTH/SPACE SCIENCE CERTIFICATION
C. SECONDARY MATHEMATICS CERTIFICATION

Nine Semester Student Schedule for **Physical Science Teaching Major** (H.S. Physics & M. S. Option - 4 ½ - year program)

Undergraduate majors only. This is to be a sample student program to include UCC, program and elective courses. The hours for each semester should be subtotaled with the total for the entire course of study listed in the bottom right hand corner. Specific UCC and elective courses should not be listed. They should be identified generally [i.e. UCC (3 or 2 hrs.) or elec. (3 - 1hr)]

FALL

FRESHMAN

Course	Hrs
Chem 111	4
Maths 165	4
Phycs 120	5
Sci 150	3
Sub Total	16

SOPHOMORE

Course	Hrs
Chem 231	4
Phycs 260	4
UCC	3
Edpsy 251	3
Edmul 205	3
Sub Total	17

JUNIOR

Course	Hrs
Phycs 354	4
Phycs 450	3
UCC	3
UCC	3
UCC	3
Sub Total	16

SENIOR

Course	Hrs
Research	3
Edjhm 385	3
Edsec 380	3
Sci 396	3
UCC	3
UCC	3
Sub Total	18

POST SENIOR

Course	Hrs
Astro 120	3
Astro 121	1
Bio 111	4
Bio 112	4
Geol 102	3
Geog 230	3
Sub Total	18

SPRING

FRESHMAN

Course	Hrs
Chem 112	4
Maths 166	4
PHYCS 122	5
UCC	3
Sub Total	16

SOPHOMORE

Course	Hrs
Chem 225	3
Phycs 262	1
Phycs 330	3
UCC	3
UCC	3
UCC	3
Sub Total	16

JUNIOR

Course	Hrs
PHYCS 340	3
Phycs 434	3
UCC	3
UCC	2
SCI 395	3
EDFON 420	3
Sub Total	17

SENIOR

Course	Hrs
Edsec 460	6
Edjhm 460	6
Sub Total	12

Grand Total 146 hrs

PHYSICS CERTIFICATION—4 yr

BALL STATE UNIVERSITY
TEACHING MAJOR IN PHYSICS - 50 hrs

This is a four-year program that will meet the high school physics certification standards of Indiana.

COMMON CORE - 34 hrs

CHEM 111	Gen Chem 1	4
CHEM 112	Gen Chem 2	4
MATHS 165	Calculus 1	4
MATHS 166	Calculus 2	4
PHYCS 120	Gen Phycs 1	5
PHYCS 122	Gen Phycs 2	5
PHYCS 260	Intro Modern (& QM)	4
PHYCS 262	Modern Lab	1
RESEARCH	(HONRS THESIS, INTERNSHIP, OR DEPT. RES)	3
		34 hrs

STUDENTS MUST COMPLETE THE HIGH SCHOOL PHYSICS CONCENTRATION AREA OR FOLLOW THE GUIDELINES OUTLINED IN SECTION II.

I. High School Physics Concentration

PHYCS 330	Mechanics	3
PHYCS 354	Electronic 1	4
PHYCS 450	Elect Magnet	3
PHYCS 340	Physcl Optics	3
PHYCS 434	Thermo	3
		16 hrs

Total 50 hrs

II. Students who currently hold or are pursuing a license in one of the following areas will not be required to complete the High School Physics Concentration area in Section 1 above.

A. SECONDARY LIFE SCIENCE
B. SECONDARY EARTH/SPACE SCIENCE
C. SECONDARY MATHEMATICS
D. SECONDARY CHEMISTRY

Eight Semester Student Schedule for **H.S. Physics Teaching Major** (4 year program)

Undergraduate majors only. This is to be a sample student program to include UCC, program and elective courses. The hours for each semester should be subtotaled with the total for the entire course of study listed in the bottom right hand corner. Specific UCC and elective courses should not be listed. They should be identified generally [i.e. UCC (3 or 2 hrs.) or elec. (3 - 1hr)]

FALL

FRESHMAN

Course		Hrs
Chem 111		4
Maths 165		4
Phycs 120		5
Sci 150		3
	Sub Total	16

SOPHOMORE

Course		Hrs
Elective		3
Phycs 260		4
UCC		3
Edpsy 251		3
Edmul 205		3
	Sub Total	16

JUNIOR

Course		Hrs
Phycs 354		4
Phycs 450		3
UCC		3
UCC		3
UCC		3
	Sub Total	16

SENIOR

Course		Hrs
Research		3
Edjhm 385		3
Edsec 380		3
Sci 396		3
UCC		3
UCC		3
	Sub Total	18

SPRING

FRESHMAN

Course		Hrs
Chem 112		4
Maths 166		4
Phycs 122		5
UCC		3
	Sub Total	16

SOPHOMORE

Course		Hrs
Elective		2
Phycs 262		1
Phycs 330		3
UCC		3
UCC		3
UCC		3
	Sub Total	15

JUNIOR

Course		Hrs
Phycs 340		3
Phycs 434		3
UCC		3
UCC		2
Sci 395		3
Edfon 420		3
	Sub Total	17

SENIOR

Course		Hrs
Edsec 460		6
Edjhm 460		6
	Sub Total	12

Grand Total 126 Hrs

PHYSICS CERTIFICATION—4½ yr

Ball State University
Teaching Major in Middle School/Junior High Science and High School Physics - 68 hrs

This is a four and one-half year program that will meet the middle school/junior high science and high school physics certification standards of Indiana.

COMMON CORE - 52 hrs

ASTRO 120	STARS STEL SYS	3
ASTRO 121	HONRS ASTR LAB	1
BIO 111	PRINC BIO 1	4
BIO 112	PRINC BIO 2	4
GEOL 102	EARTH TIME (3 hr)	3
GEOG 230	ELM METEOR (3 hr)	3
		18 hrs

CHEM 111	Gen Chem 1	4
CHEM 112	Gen Chem 2	4
MATHS 165	Calculus 1	4
MATHS 166	Calculus 2	4
PHYCS 120	Gen Phycs 1	5
PHYCS 122	Gen Phycs 2	5
PHYCS 260	Intro Modern (& QM)	4
PHYCS 262	Modern Lab	1
RESEARCH	(HONRS THESIS, INTERN, OR DEPT. RES)	3
		34 hrs

Common Core Total 52 hrs

STUDENTS MUST COMPLETE THE HIGH SCHOOL PHYSICS CONCENTRATION AREA OR FOLLOW THE GUIDELINES OUTLINED IN SECTION II.

I. High School Physics Concentration

PHYCS 330	Mechanics	3
PHYCS 354	Electronic 1	4
PHYCS 450	Elect Magnet	3
PHYCS 340	Physcl Optics	3
PHYCS 434	Thermo	3
		16 hrs

Total 68 hrs

II. Students who currently hold or are pursuing a license in one of the following areas will not be required to complete the High School Physics Concentration area in Section 1 above.

A. SECONDARY LIFE SCIENCE
B. SECONDARY EARTH/SPACE SCIENCE
C. SECONDARY MATHEMATICS
D. SECONDARY CHEMISTRY

Nine Semester Student Schedule for **H.S. Physics Teaching Major with M.S. Science Option** (4½ year program)

Undergraduate majors only. This is to be a sample student program to include UCC, program and elective courses. The hours for each semester should be subtotaled with the total for the entire course of study listed in the bottom right hand corner. Specific UCC and elective courses should not be listed. They should be identified generally [i.e. UCC (3 or 2 hrs.) or elec. (3 - 1hr)]

FALL

FRESHMAN

Course		Hrs
Chem 111		4
Maths 165		4
Phycs 120		5
Sci 150		3
	Sub Total	16

SOPHOMORE

Course		Hrs
Astro 120		3
Astro 121		1
Phycs 260		4
UCC		3
Edpsy 251		3
Edmul 205		3
	Sub Total	17

JUNIOR

Course		Hrs
Phycs 354		4
Phycs 450		3
UCC		3
UCC		3
UCC		3
	Sub Total	16

SENIOR

Course		Hrs
Research		3
Edjhm 385		3
Edsec 380		3
Sci 396		3
UCC		3
	Sub Total	15

SENIOR

Course		Hrs
Bio 111		4
Bio 112		4
UCC		3
Geog 230		3
	Sub Total	14

SPRING

FRESHMAN

Course		Hrs
Chem 112		4
Maths 166		4
Phycs 122		5
UCC		3
	Sub Total	16

SOPHOMORE

Course		Hrs
Geol 102		3
Phycs 262		1
Phycs 330		3
UCC		3
UCC		3
UCC		3
	Sub Total	16

JUNIOR

Course		Hrs
Phycs 340		3
Phycs 434		3
UCC		3
UCC		2
Sci 395		3
Edfon 420		3
	Sub Total	17

SENIOR

Course		Hrs
Edsec 460		6
Edjhm 460		6
	Sub Total	12

Grand Total 139 Hrs