



Benha University
Faculty of Science

Applied Physics
B.Sc. Program

2015/2016



Applied Physics B.Sc. Program Specification

A. Basic Information

Program Title:	Applied Physics B.Sc. Program
Program Type:	Major
Department Responsibility:	Physics Department
Coordinator:	Ass, Prof. Mahmoud H. Makled
Internal Evaluator:	Professor : Efit Eshaaq
External Evaluator:	Professor: Tawfik A. Eldesoky

Assistant Co-ordinator: Name/s of assistant coordinator/s.

Dates of program specifications approval: 9/12/2015

B. Professional Information

1. Program Aims

The special physics program is an academic program produced by Physics Department. It aims to introduce knowledge, experience and practices in Physics ,thus:

The overall aims are to provide the graduate with the following

- The role of Physics and Basic Science in the development of society
- Physical facts and theories to analyze and interpret practical data
- Fundamental ideas about the physical behavior of matter and energy to system's structure and function.
- Scientific information and applications in the most of physical branches specially in applied physics area, such as radiation physics, Crystal structure, Nano materials. Semicconductors and optical electronics
- Classification and identification the materials or physical phenomena according physics guidelines and Collection, analyses, and presentation of data using appropriate formats and techniques.
- Graduates are expected to become investigators in industrial or research institutions, scientific reporters, technical consultants, employed in information technology companies, educational institutions and health care organizations



- g) Application of physics principles on modern areas of physics research and to choose appropriate solutions to solve problems on scientific basis
- h) How to develop communication, writing and scientific presentation skills

2. Intended Learning Outcomes (ILO's)

2.1 Knowledge and Understanding

By the end of the program, the graduate will be able to:

- a.1 Investigate the physical facts of (matter, fluids, optics ,energy, nuclear and other physical branches), physical concepts of (thermodynamics, electromagnetism and most of physical phenomena) , physical principles and techniques. .
- a.2 Select and use some of special functions, equations and computer programs to solve the related physical problems according to classical and quantum physics
- a.3 Describe the relation between structure, composition and Physical properties
- a.4 Identify the theoretical and practical aspects of atomic, biophysics, solid state and other related branches in addition to physical phenomena, systems and applications.
- a.5 Memorize the processes and mechanisms supporting the structure, and Physical properties of matter and physical systems.
- a.6 Define microscopic and macroscopic studies for different physical area and physical problems
- a.7 Understand the advanced theories, models, methods and techniques to interpret and analyze data, related to the physical discipline.
- a.8 Understand the essential facts, major concepts, principles, and theories in most basic sciences branches and other sciences to understand the recent advances in Physics

2.2 Intellectual Skills

By the end of the program, the graduate will be able to:

- b.1 Differentiate between the different states of the matter, elements and compounds based on the recognition and quantification of the properties.
- b.2 Organize spacial function, equation , models and programs to exam the validity of the physical laws and analyze system components.
- b.3 Interpret and analyze the practical data and physical properties qualitatively and quantitatively.
- B.4 Solve the physical problems by the appropriate judgments in accordance with physical theories and concepts to choose optimum solutions.



- b.5 Confirm the suitable technique to study crystal structure, fluid mechanics, plasme systems, digital networks. and any physical topic , system and phenomena
- b.6 Modify most of the physical properties of different materials by the modification of structure, composition and synthesis method.

2.3 Skills

2.3.1 Professional and Practical Skills

By the end of the program, the graduate will be able to:

- c.1 Sketch and prepare the physical systems, techniques and data considering physical guidance
- c.2 Analyze the computational programs to interpret the physical and mathematical problems
- c.3 Summarize the practical data according to national standard
- c.4 Collect comprehensive physical knowledge and intellectual skills to solve the physical problems by acceptable methods in research tasks.
- c.5 Judge to apply physics principles and mathematical tools to modern areas of physics research.
- c.6 Able to conduct experiments, techniques and report the theoretical and experimental results in the understandable forms such as tables and graphs.

2.3.2 General Skills

By the end of the program, the graduate will be able to:

- d.1 Use computers and internet for communication, data handling and word processing.
- d.2 Communicate to work efficiently in a team or separately
- d.3 Solve physical problems on scientific basis.
- d.4 Effectively manage tasks, time, and resources.
- d.5 Search for information and engage in life-long self learning discipline.
- d.6 Able to perform, read and interpret scientific literature

3- Academic standards of the program

The program outcomes are derived from National Academic Reference Standards (NARS) for Single programs in Science Faculties (Physics).

4- Reference indices (Benchmarks)

4.1 The program outcomes are derived from National Academic Reference Standards (NARS) for single programs in Science Faculties (Physics).



5- Program structure and contents

a- **Program duration:** four levels (8 semesters)

b- **Program structure:**

Program	Credit hours
Compulsory	118
Optional	18
Elective	4
Total	140

Program	Credit hours	Percentage
Basic sciences	33	23.57 %
Humanities (including language)	5	3.57 %
Specialized courses	97	69.29%
Computer and IT	5	3.57%
Total	140	100 %

d- Program Courses:

- Symbols in the list and their meanings

Connotation	Symbol
University requirement	Ur
Faculty requirement	Fr
Botany	B
Chemistry	Ch
Entomology	E
Geology	G
Mathematics	M
Physics	Ph
Zoology	Z



University requirements

The student studies (8 credit hours) at First level

Code No.	Course Title	No. of Units	No. of hours/Week			Level
			Lect.	Ex-er.	Prac.	
015 Ur	English (1)	2	2	-	-	first
030 Ur	Computer Science (1)	3	2	-	2	first
040 Ur	Computer Science (2)	2	1	-	2	first
050 Ur	Human Rights	1	1	-	-	first

B-Faculty requirements

B1-Compulsory courses

The student studies (18 credit hours) at First level

100 M	General Mathematics (1)	3	2	2	-	first
105 M	General Mathematics (1)	3	2	2	-	first
100 Ph	General Physics (1)	2	2	-	-	first
180 Ph	Practical Physics (1)	1	-	-	3	first
105 Ph	General Physics (2)	2	2	1	-	first
181 Ph	Practical Physics (2)	1	-	-	3	first
100 Ch	General Chemistry (1)	2	2	1	-	first
180 Ch	Practical Chemistry (1)	1	-	-	3	first
105 Ch	General Chemistry (2)	2	2	1	-	first
181 Ch	Practical Chemistry (2)	1	-	-	3	first

B2-Elective courses:

The student studies (6 credit hours) at First level,

183 Ch	Inorganic applied Chemistry(1)	1	-	2	-	first
183 Ph	Applied Physics (1)	1	-	2	-	first
185 Ch	organic applied Chemistry (2)	1	-	2	-	first



185 Ph	Applied Physics (2)	1	-	2	-	First
100 Z	General Zoology (1)	2	1	-	2	first
105 Z	General Zoology (2)	2	1	-	2	first
100 B	General Botany (1)	2	1	-	2	first
105 B	General Botany (2)	2	1	-	2	first
100 G	General Geology (1)	2	1	-	2	first
105 G	General Geology (2)	2	1	-	2	first
111 IN	General Insects (1)	2	1	-	2	first
112 IN	General Insects (1)	2	1	-	2	first
11 Ur	Healthy Nutrition	2	2	-	-	first
12 Ur	History of Sciences	2	2	--	-	first
13 Ur	Healthy nutrition	2	2	-	-	first
14 Ur	Scientific thinking	2	2	-	-	first
17 Ur	Labor Law	2	2	-	-	first
19 Ur	Selected subjects from Egypt -----history	2	2	-	-	first

Second level courses

Compulsory courses in First Semester						
223 Ph	Thermodynamics.	3	2	2	-	Second
261 Ph	Electricity, magnetism and AC current	3	3	1	-	Second
271 Ph	Physical Optics and optical fibers	3	3	-	-	Second
275 Ph	Thermodynamics and optics lab.	2	-	-	4	Second
211 M	Advanced calculus	3	2	2	-	Second
Elective one course in First Semester						
251 M	object programming	3	2	2	-	



323 M	Numerical Analysis	3	3		-	
		17	Total credit hours			
Compulsory courses in Second Semester						
212 Ph	waves and oscillations	3	2	2	-	Second
215 Ph	Modern physics	3	2	2	-	Second
256 Ph	Metals, alloys and ceramic physics	3	3	-	-	Second
265 Ph	Electricity, magnetism and AC current lab	2	-	-	4	Second
212 M	Differential equation (1)	3	2	2	-	Second
Elective one course in second Semester						
361 M	Logic circuits	3	2	2	-	
323 M	Numerical Analysis	3	3		-	
		17	Total credit hours			

Third Level Courses

Compulsory courses in First Semester						
311 APh	Electronic Quantum mechanics (1)	3	2	2	-	Third
313 APh	Bio physics of cell	3	3	-	-	Third
315 Ph	Modern Physics lap (1)	2	-	-	4	Third
353 Ph	Solid state (1)	3	3	-	-	Third
355 Ph	Solid state lap. (1)	1	-	-	3	Third
361 APh	Digital Electronics (1)	3	3	-	-	Third
Elective one course in first semester						
323 M	Numerical Analysis	3	3		-	
357 M	Data Base	3	2	2	-	
		18	Total credit hours			



Compulsory courses in Second Semester						
312 APh	Theory of electromagnetism and electrodynamics	3	3	1	-	Third
332 Ph	Plasma physics and applications	3	3	-	-	Third
342 Ph	Nuclear Physics (1)	3	3	-	-	Third
345 Ph	Nuclear Physics Lap (1)	1	-	-	3	Third
354 APh	Physics health and radiation protection	3	3	-	-	Third
365 APh	Electronics Lab (1)	1	-	-	3	Third
382 Ph	Astrophysics	3	3	-	-	Third
Elective one course in Second Semester						
332 Ch	Surface chemistry, catalysis, colloids, and solid state	3	3		-	
354 M	Computer network	3	2		2	
		18	Total credit hours			

Fourth level courses

Compulsory courses in First Semester						
411 APh	Material quantum mechanics	3	3	-	-	Fourth
443 APh	Experimental Methods	3	3	-	-	Fourth
451 APh	Physics of semiconductors systems	3	3	-	-	Fourth
453 Ph	Magnetic resonance and spectral Mossbauer	3	3	-	-	Fourth
455 APh	Semiconductor Lab	1	-	-	3	Fourth
457 APh	Communication physics	3	3	-	-	Fourth
Elective one course in First semester						
491 APh	Selected subject in physics (1)	3	3	-	-	
419 M	Mathematical analysis	3	2	2		
		19	Total credit hours			



Compulsory courses in Second Semester						
400 APh	Research and Essay	2	2	-	-	Fourth
414 APh	Environmental physics	3	3	-	-	Fourth
422 Ph	Low temperature and super-conductors	3	3	-	-	Fourth
432 APh	Introduction to energy science	3	3	-	-	Fourth
458 Ph	Nano materials physics and application	3	3	-	-	Fourth
472 APh	Physics of Optical electronics	3	3	-	-	Fourth
Elective one course in Second Semester						
462 Ph	Mathematical physics using computer	3	3	1	-	Fourth
492 APh	Selected subject in physics (2)	3	3	-	-	
		19	Total credit hours			

See course specification forms

Contents of the Courses

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7- Program admission requirements

- Faculty of Benha Science accepts students who have a high school (the scientific branches) or equivalent according to the admission requirements specified by the Supreme Council of Universities.
- Faculty of Benha Science accepts transfer students from other science faculties; provided that the number of credit hours that were studied not more than 50% of the total number of credit hours necessary for his graduation. The student is exempt from the courses studied by successfully whatever their level.

8- Regulations for progression and program completion:

According to the bylaw of the faculty of Benha Science, the regulations for progression and program completion in any discipline single or double requirement is 140 credit hours at least distributed as follows: -



- (1) University requirements for a bachelor's degree in any single discipline or double 8 credit hours is mandatory.
- (2) The total requirements for a bachelor's degree in any single discipline or a double is 24 credit hours, including 18 compulsory hours +6 optional hours.
- (3) Specialty requirements for a bachelor's degree in any single discipline or a double is determined by Section 108 certified or relevant departments to specialize hour.
- (4) leads college students summer training for six weeks in the relevant areas of specialization Applied before graduation to not be training only after the student completed 90 credits at least an hour and do not count him credit hours.
- (5) Scientific field trips serve the area of specialization.

▪ **Joining the Program:**

A - Vice Dean for Education and Student Affairs supervises on the implementation of the registration rules and procedures and prepare menus for each of the study groups, schedule, distribute students gentlemen academic advisers, processing cards courses for students which is about cards individual for each course as well as cards total for each student, that academic record data in accredited private records, and the completion of enrollment of students in the first week of the start of the semester.

B - Students may register early, after announcing the results of the end of the spring.

C - Take into account when you log decision student success in Prerequisite if any.

D - A student who was not able to register for compelling reasons approved by the Student Affairs Committee and approved by the College Board to register record late in the additional period for registration (the second week).

E - Student selects one branch to research and essay from two specialized branches.

▪ **Study load:**

Students are allowed to register in at least 14 credit hours and no more than 19 credit hours per semester. With the exception of the following cases:

A - A student can superior (who has a cumulative average of 3 or more) that adds to it two hours, certified in one semester and a maximum of 8 credit hours throughout the study period in decisions, additional optional requirements, specialization departments, college different, that is added appreciation where to CGPA It is not permitted to be an elective requirement for another decision.

B-The College Board may increase the maximum for the academic workload in the last semester of the student up to a maximum of four credit hours to complete graduation requirements.

C - Not allows the student who has a cumulative rate (1) to register in more than 12 credit hours in a semester.

▪ **Additions, deletions, withdraw and modify the path:**

A - Any student after the approval of the academic advisor to add or delete scheduled or two until the end of the second week only study and without prejudice to the burden stipulated.

B - Student may withdraw from the study any decision until the end of the seventh week of the start of registration for the semester with the approval of the academic advisor. The record of this decision in the student's academic record estimate "withdrawn" on the condition that the student does not have absenteeism overruns before the withdrawal. And cases before the forced withdrawal



over this period the Commission Education and Student Affairs for consideration and approval of the Faculty Council on the withdrawal shall be without prejudice boarding school student.

C - A student may alter the course of the specialization subject to the completion of the requirements of specialization desirable and not counting credit hours, which the student obtained by not located in the area of the requirements of the new specialization and after the approval of the academic advisor and the Committee on Education and Student Affairs and the College Board on this amendment.

▪ **Stop registration or drop out**

A - Stop registration: the student can apply to stop his registration for one semester and a maximum of four separate classes are connected and for compelling reasons approved by the College Board.

B - Dropout: the student can re-record if he dropouts for maximum two semesters and for compelling reasons approved by the College Board.

▪ **Attendance:**

A - The instructor shall register the presence of students at the start of each lecture theory or process in a practical period Prepared for by the Student Affairs and delivers this record at the end of the semester to manage the affairs of Students.

B - When the student exceeds the absence of 10% of the scheduled hour's instructor shall notify the Department of Affairs Students to guide the first warning to the student.

C - When the student exceeds the proportion of the absence of 20% of the scheduled hour's instructor shall notify the Department Student Affairs to direct second and final warning to the student.

D - If increased absenteeism 25% of the total scheduled hours and the absence of a student without an acceptable excuse Student Affairs Committee and approved by the College Board, student records estimate" deprived" decision and intervention as a result of failure to calculate the cumulative average of the student.

E - If increased absenteeism was 25% and the absence of the student excuse acceptable to the Commission, Education and Student Affairs and approved by the College Board, student records withdraw from the course.

F - In the case of a request student add a new decision attendance is calculated from the date of registration.

9- Methods and rules of evaluation of students in rolled in the program:

Rating:

The exam is evaluated each courses at 100 degrees and distributed degrees scheduled as follows:

9.1 courses which did not include the part "practical"

Method of Assessment	Weighting	learning outcomes assessed
Mid term exam & Semester work	10%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.



Final Oral Exam	10 %	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final Term Examination	80%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.

9.2 courses practical separate

Method of Assessment	Weighting	learning outcomes assessed
Mid term exam & Semester work	20%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final Oral Exam	20 %	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final practical Examination	60%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.

9.3 courses which include part "practical"

Method of Assessment	Weighting	learning outcomes assessed
Mid term exam & Semester work	16%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final Oral Exam	12 %	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final practical Examination	24%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final Term Examination	48%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.

9.4 Course search and essay

A - 60% of the total score for the course of the various activities carried out by the student during his study of the course.

B- 40% of the total scores for the course of the 13 discussion session



e. Estimated grades and points obtained by the student in each course as follows:

Grade	Symbol	Number of points	Mark
Excellent	A	4	90-100%
	A-	3.7	85-<90%
Very good	B+	3.3	80-<85%
	B	3	75-<80%
Good	B-	2.7	70-<75%
	C+	2.3	65-<70%
Pass	C	2	60-<65%
Failed	F	0	<60%
Absent	F-	0	-

10- Learning resources:

a- Adequacy of laboratories:

The department has 6 student labs which are relatively enough in proportion to the number of students.

- Infra Structure:

- The faculty begin preparing the infra structure of the department through renewing the four student labs exist in the 4st floor of the Physics department. The plan of refurbishing based on repairing the damaged benches Floors and windows, painting walls providing labs with electric fans and enough lights. In addition to replacing the old wallboard into modern one and provide labs with new instruments.

b- Adequacy of Computer facilities

Some of the staff member's rooms need new PCs.

e- Adequacy of field/practical training resources:

The department arranges 1 Week scientific trip for 3th Year students.

There is summer training by the department itself, and the department provides some students of the third year the chance for summer training at related companies. Some staff members



provide students the chance to get their summer training at their labs.

b- Matching of the faculty members specialization to program needs:

Specification Area Status

Gogood enough.

c- availability and adequacy of program handbook:

Available: $\sqrt{\quad}$ Not Available

d- Adequacy of library facilities:

Adequate: $\sqrt{\quad}$ Not adequate

e- Adequacy of laboratories:

Adequate: $\sqrt{\quad}$ Not adequate

f- Adequacy of computer facilities:

Adequate: $\sqrt{\quad}$ Not adequate

g- Adequacy of field/practical training resources:

Adequate: $\sqrt{\quad}$ Not adequate

11- Quality Management:

a- **effectiveness of the system:** Effective: $\sqrt{\quad}$ Not effective: --

b- **Effectiveness of Faculty and University laws and regulations for progression and completion:** Effective: $\sqrt{\quad}$ Not effective: --

c- **Effectiveness of program external evaluation system:**

i- External evaluators: Effective: $\sqrt{\quad}$ Not effective: --

ii- Students: Effective: $\sqrt{\quad}$ Not effective: --

iii- Other stallholders: Effective: -- Not effective: --

d- **Faculty response to student and external evaluations:**

Most comments and suggestions of the students and external evaluations were discussed several times during faculty meetings and reviewed by the course instructors and are applied into the action plan for the next academic year.

12- Proposal for program development



- a- Program structure (units/credit hours): credit hours
- b- Courses, deletion, additions and modifications: provided in the action plan for the next year
- c- **Staff development requirements:** More facilities for different laboratories and resources for the library are required.

I- Physics department Plans

13- Progress of the previous year's action plan:

Task	<u>Sectors</u>	Progress of action
Curriculum has to be in the credit hours system to give the student the opportunity to choose what they like in the proper time.	Head of Physics department and all courses instructors	credit hours system has started by the academic year 2010/2011
Refurbishing of three labs in the 4 st floor (fore students and one in the 5 th floor)	Head of Physics department	The four labs were renewed through painting, repairing the damaged floors, benches and windows and are ready to be used.
Purchase some new experimental tools, materials as well as, new scientific systems	Head of Physics department	Several suction and aeration systems were purchased
Purchase some new instruments:	Head of Physics Department and Dr. Islam Sheha	Electrochemical test station and buttery analyzer
Purchase data show and white screen board for the department		data show and white screen board were purchased



In most cases the lecturer are not using modern means and tools of interactive teaching	Department head and All courses instructors	Many of the courses instructors prepared their courses by power point data presentation
equipping Seminar halls with white boards, projectors or data show and computers.	Department head and All courses instructors	Offering data show computers in the class rooms. Seminar hall not yet arranged
Enhancement of the student field training program	Head of Physics Department and all department staff members	Some staff members provide students the chance to get their summer training at their labs.

13- Next year action plan (2015-2016):

<u>No.</u>	<u>Task</u>	<u>Period</u>	<u>Sectors</u>	<u>Leading responsibility</u>	<u>Cost estimates</u>	<u>Risk Parameters</u>
<u>1</u>	Development of courses: 1- Contents 2- Notes 3- Laboratory equipment's	one year	-All department Staff members.	-Head of Physics Department	-	-
<u>2</u>	Physics work day	<u>One term</u>	-Head of Physics Department -Prof. <u>Mo-hamed Ali</u>	Head of Physics Department -Dean and vice Dean		No fund or insufficient fund
<u>3</u>	Refurbishing of solid state and Laser research lab	one year	-Head of Physics Department -Prof. <u>Mahmoud Makled and Nabile henday</u>	-Head of Physics Department -Dean and vice Dean	100.000 LE	



II- Microbiology Department Plans:

13- Action plan:

Action required	Person Responsible	Completion date
Enrich the department library with more updated text books recommended by the courses instructors.	The library committee assigned by the department head and faculty members	During the second semester of the academic year 2015-2016
contact with several civilian society organization for the summer training	Department head and Dr. Mohamed Abed Elmenem All courses instructors	Academic year 2014-2015 And 2015-2016
Increase the number of experiments to conduct several the market	Department head and All courses instructors	Second term Academic year 2014-2015
Update the practical training sections and courses to go hand in hand with needs of the local market	All courses instructors	Started by the academic year of 2011-2012
Purchase new tools for the laboratory uses for the undergraduates of the Applied physics program	Prof Dr. Mahmoud Makled	Several exepriments were purchased in the academic year 2015-2016



Fix new white boards in the student labs	Department head and All courses instructors	New white boards will be fixed by the beginning of the academic year of 2013-2014
Renew the preparation Department head and By the beginning of experimental room of the department	Department head and Faculty instructors	By the beginning of academic year of
Department offer question banks for the students in all courses	Department head and All courses instructors	By the end of the academic year 2015-2016
The Department offer Student text books for some courses (Genetics)	All of the stuff	By the end of the academic year 2015-2016
Some courses need to be updated their code and pre-requisite courses	Department head and All courses instructors	By the end of the academic year 2015-2016
Some courses should be as electronic version and on line.	Department head and All courses instructors	By the beginning of the academic year 2016/2017
Constructing the Electronic herbarium of the Department	Head of the Department Dr . Mohamed Ali Dr . Tarek Yosef	By the end of the academic year 2015/2016

Program Coordinators: Prof. Mahmoud H. Makled

Head of the Physics Department: Prof. Mervat Gamal Sharawy

11- Methods of program evaluation:

Evaluator	Tool	Sample
1- Senior Students	Questionnaire	Not less than 25%
2- Alumni	Questionnaire	Not less than 25%
3- Stakeholders	Questionnaire, workshops, seminars, conferences	Representative for all sectors
4- External Evaluators	Reports	Report 1-2
5- Internal Evaluators	Reports	Report 1-2



National Academic Reference Standards (NARS)

Basic Sciences

I. National Academic Reference Standards

1. National Academic Reference Standards

1.1. General Attributes of the Graduates of Basic Sciences

The graduates must be able to:

- 1.1.1. Recognize the role of Basic Sciences in the development of society.
- 1.1.2. Develop scientific approaches that meet community needs considering economic, environmental, social, ethical, and safety requirements.
- 1.1.3. Utilize scientific facts and theories to analyze and interpret practical data.
- 1.1.4. Collect, analyze, and present data using appropriate formats and techniques.
- 1.1.5. Postulate concepts and choose appropriate solutions to solve problems on scientific basis.
- 1.1.6. Apply effectively information technology relevant to the field.
- 1.1.7. Participate effectively in a multidisciplinary teamwork and be flexible for adaptation, decision making and working under contradictory conditions as well as exhibiting the sense of beauty and neatness.
- 1.1.8. Adopt self and long life-learning and participate effectively in research activities.
- 1.1.9. Deal with scientific data in Arabic, English or other languages.

1.2. Knowledge and Understanding

Graduates must acquire knowledge and understanding of:

- 1.2.1. The related basic scientific facts, concepts, principles and techniques.
- 1.2.2. The relevant theories and their applications.
- 1.2.3. The processes and mechanisms supporting the structure and function of the specific topics.
- 1.3. The related terminology, nomenclature and classifica-



tion systems.

1.2.4. The theories and methods applied for interpreting and analyzing data related to discipline.

1.2.5. The developmental progress of the program-related knowledge.

1.2.6. The relation between the studied topics and the environment.

1.3. Practical and Professional Skills

The graduates must be able to:

1.3.1. Plan, design, process and report on the investigated data, using appropriate techniques and considering scientific guidance.

1.3.2. Apply techniques and tools considering scientific ethics.

1.3.3. Solve problems using a range of formats and approaches.

1.3.4. Identify and criticize the different methods used in addressing subject related issues.

1.4. Intellectual Skills

The graduates must be able to:

1.4.1. Differentiate between subject-related theories and assess their concepts and principles.

1.4.2. Analyze, synthesize, assess and interpret qualitatively and quantitatively science relevant data.

1.4.3. Develop lines of argument and appropriate judgments in accordance with scientific theories and concepts.

1.4.4. Postulate and deduce mechanisms and procedures to handle scientific problems.

1.4.5. Construct several related and integrated information to confirm, make evidence and test hypotheses.

1.5. General and Transferable Skills

The graduates must be able to:

1.5.1. Use information and communication technology effectively.

1.5.2. Identify roles and responsibilities, and their performing manner.



- 1.5.3. Think independently, set tasks and solve problems on scientific basis.
- 1.5.4. Work in groups effectively; manage time, collaborate and communicate with others positively.
- 1.5.5. Consider community linked problems, ethics and traditions.
- 1.5.6. Acquire self- and long life-learning.
- 1.5.7. Apply scientific models, systems, and tools effectively.
- 1.5.8. Deal with scientific patents considering property right.
- 1.6.9. Exhibit the sense of beauty and neatness

2. National Academic Reference Standards for Physics

Physics is the study of energy and behavior of single atom and its components. Physics is the foundation upon which the other physical sciences are based such as; astronomy, chemistry and geology. The beauty of physics lies in the simplicity of the fundamental physical theories and assumptions that can alter and expand our view of the world around us. Like all sciences, physics is based on experimental observations and quantitative measurements. The main objective of physics is to use a limited number of fundamental laws that govern natural phenomena to develop theories that can predict the results of future experiment.

Physicists are expected to become investigators in industrial or research institutions. They can also have careers as air navigators and instrument manufacturers, scientific reporters, technical consultants and university staff members. They can also be employed in information technology companies, educational institutions and health care organizations.

2.1. The Attributes of a Physicist

In addition to the general attributes of basic sciences graduates, the physics graduates must be able to:

- 2.1.1. Demonstrate a good basic knowledge of structural and functional aspects of physical systems at many spatial scales,



from single molecule to the whole system.

- 2.1.2. Connect fundamental ideas about the physical behavior of matter and energy to system's structure and function.

2.2. Knowledge and Understanding

In addition to the general knowledge acquired by Basic Sciences graduates, the physics graduates must know and understand the:

- 2.2.1. Characteristics and physical properties of matter.
- 2.2.2. Static and dynamic properties of fluids.
- 2.2.3. The Basics of Electricity.
- 2.2.4. Concepts of electromagnetism.
- 2.2.5. Principles of heat transfer and thermodynamics.
- 2.2.6. Theoretical and practical aspects of optics, nuclear physics and other related branches.
- 2.2.7. Application of advanced physical techniques.
- 2.2.8. Basics and mechanisms of energy transfer.

2.3. Practical and Professional skills

In addition to the general skills acquired by Basic Sciences graduates, the physicist must be able to:

- 2.3.1. Apply mathematical tools and techniques to analyze and interpret experimental results.
- 2.3.2. Implant comprehensive physical knowledge and understanding as well as intellectual skills in research tasks.
- 2.3.3. Use the national standards for laboratory equipment which are essential for practical research work.



- 2.3.4. Present theoretical and experimental results in understandable forms such as tables and graphs.

2.4. Intellectual skills

In addition to the general skills acquired by Basic Sciences graduates, the physicist must be able to:

- 2.4.1. Utilize theories of physics to interpret physical phenomena.
- 2.4.2. Apply appropriate physical principles to create and analyze system components.
- 2.4.3. Choose optimum solutions for physical problems based on analytical thinking.



Program Matrixes

Faculty mission vs. Applied Physics program design matrix

I. Program attributes vs. faculty mission

Program Aims: The overall aims of the program are to provide the graduate with:		Faculty mission The Faculty of Science, Benha University, confesses and admits to:		
		promote a distinct graduate who will be able to conduct research and innovation that will help him in the labor market competition, taking into account the ethics of the profession,	conduct high-value scientific research that deserves regional and international awareness and publication	recruit human resources and applied research to provide training services and scientific consultation for environmental issues and society development
a	The role of Physics and Basic Sciences in the development of society	√		√
b	Physical facts and theories to analyze and interpret practical data		√	
c	Connect Fundamental ideas about the physical behavior of matter and energy to system's structure and function.	√	√	



d	Scientific information and applications in the most of physical branches specially in applied physics area, such as radiation physics, Crystal structure, Nano materials. Semicounductors and optical electronics	√	√	√
e	Classification and identification the materials or physical phenomena according physics guidelines and Collection, analyses, and presentation of data using appropriate formats and .techniques	√	√	
f	Graduates are expected to become investigators in industrial or research institutions, scientific reporters, technical consultants, employed in information technology companies, educational institutions and health care organizations	√	√	√
g	Application of physics principles on modern areas se appropriate solutions to solve pof physics research and to chooroblems on scientific basis	√	√	
.h	How to develop communication, writing and scientific presentation skills	√	√	√



II. Program Intended Learning Outcomes (ILOs) vs. the faculty mission

a) Knowledge and Understanding

Program Aims: The overall aims of the program are to provide the graduate with:		Faculty mission The Faculty of Science, Benha University, confesses and admits to:		
		promote a distinct graduate who will be able to conduct research and innovation that will help him in the labor market competition, taking into account the ethics of the profession,	conduct high-value scientific research that deserves regional and international awareness and publication	recruit human resources and applied research to provide training services and scientific consultation for environmental issues and society development
a.1	Investigate the physical facts of (matter, fluids, optics, energy, nuclear and other physical branches), physical concepts of (thermodynamics, electromagnetism and most of physical phenomena) , physical principles and techniques. .	√		
a.2	Select and use some of special functions, equations and computer programs to solve the related physical problems according to classical and quantum physics			√
a.3	Describe the relation between structure, composition and Physical properties	√	√	√



a.4	Identify the theoretical and practical aspects of atomic, biophysics, solid state and other related branches in addition to physical phenomena, systems and applications.	√	√	
a.5	Memorize the processes and mechanisms supporting the structure, and Physical properties of matter and physical systems.	√	√	√
a.6	Define microscopic and macroscopic studies for different physical area and physical problems		√	√
a.7	Understand the advanced theories, models, methods and techniques to interpret and analyze data, related to the physical discipline.	√	√	
a.8	Understand the essential facts, major concepts, principles, and theories in most basic sciences branches and other sciences to understand the recent advances in Physics	√	√	√



b) Intellectual Skills

Program Aims: The overall aims of the program are to provide the graduate with:		Faculty mission The Faculty of Science, Benha University, confesses and admits to:		
		promote a distinct graduate who will be able to conduct research and innovation that will help him in the labor market competition, taking into account the ethics of the profession,	conduct high-value scientific research that deserves regional and international awareness and publication	recruit human resources and applied research to provide training services and scientific consultation for environmental issues and society development
b.1	Differentiate between the different states of the matter, elements and compounds based on the recognition and quantification of the properties.	√		
b.2	Organize special function, equation, models and programs to examine the validity of the physical laws and analyze system components.	√	√	
b.3	Interpret and analyze the practical data and physical properties qualitatively and quantitatively.		√	√



b.4	Solve the physical problems by the appropriate judgments in accordance with physical theories and concepts to choose optimum solutions	√	√	
b5.	Confirm the suitable technique to study crystal structure, fluid mechanics, plasma systems, digital networks. and any physical topic , system and phenomena	√		√
b6.	Modify most of the physical properties of different materials by the modification of structure, composition and synthesis method	√	√	√



c) Professional and Practical Skills

<p>Program Aims: The overall aims of the program are to provide the graduate with:</p>		<p>Faculty mission The Faculty of Science, Benha University, confesses and admits to:</p>		
		<p>promote a distinct graduate who will be able to conduct research and innovation that will help him in the labor market competition, taking into account the ethics of the profession,</p>	<p>conduct high-value scientific research that deserves regional and international awareness and publication</p>	<p>recruit human resources and applied research to provide training services and scientific consultation for environmental issues and society development</p>
c1.	Sketch and prepare the physical systems, techniques and data considering physical guidance	√	√	
c2.	Analyze the computational programs to interpret the physical and mathematical problems	√	√	√
c3.	Summarize the practical data according to national standard	√	√	√
c4.	Collect comprehensive physical knowledge and intellectual skills to solve the physical problems by acceptable methods in research tasks.	√	√	√
c5.	Judge to apply physics principles and mathematical tools to modern areas of physics research.	√	√	√
C6.	Able to conduct experiments, techniques and report the theoretical and experimental results in the understandable forms such as tables and graphs.	√		√



d) General Skills

		Faculty mission The Faculty of Science, Benha University, confesses and admits to:		
		promote a distinct graduate who will be able to conduct research and innovation that will help him in the labor market competition, taking into account the ethics of the profession,	conduct high-value scientific research that deserves regional and international awareness and publication	recruit human resources and applied research to provide training services and scientific consultation for environmental issues and society development
Program Aims: The overall aims of the program are to provide the graduate with:				
d1.	Use computers and internet for communication, data handling and word processing.	√	√	
d2.	Communicate to work efficiently in a team or separately	√	√	√
d3.	Solve physical problems on scientific basis.	√	√	
d4.	Effectively manage tasks, time, and resources.	√	√	√
d5.	Search for information and engage in life-long self-learning discipline.	√	√	√
d6.	Able to perform, read and interpret scientific literature	√	√	



**Program aims of Applied Physics and attributes of graduate
in Applied Physics NARS matrix**

Attributes of graduate in Applied Physics NARS		Program aims of Applied Physics							
		a	b	c	d	e	f	g	h
1	Demonstrate a good basic knowledge of structural and functional aspects of physical systems at many spacial scales, from single molecule to the whole system	x			x	x			
2	Connect fundamental ideas about the physical behavior of matter and energy to system's structure and function			x		x			
3	Utilize scientific facts and theories to analyze and interpret practical data				x				
4	Apply effectively information technology relevant to the field							x	
5	Develop scientific approaches that meet community needs considering economic, environmental, social, ethical, and safety requirements						x		x
6	Collect, analyze, and present data using appropriate formats and techniques		x						
7	Adopt self and long life-learning and participate effectively in research activities						x		

NARS ILOs matrix&Applied Physics B.Sc. Program ILOs

Applied Physics B.Sc. NARS ILOs		Applied Physics B.Sc. Program ILOs							
Knowledge and Understanding		Knowledge and Understanding							
		a.1	a.2	a.3	a.4	a.5	a.6	a.7	a.8
1	Characteristics and physical properties of matter.	x		x		x			
2	Static and dynamic properties of fluids.	x					x		
3	The Basics of Electricity.	x					x		
4	Concepts of electromagnetism.	x							
5	Principles of heat transfer and thermodynamics.	x							
6	Theoretical and practical aspects of optics, nuclear physics and other related branches.				x		x	x	x
7	Appli Application of advanced physical techniques.		x			x		x	x
8	Basics and mechanisms of energy transfer 2.2.8.	x			x		x		

Applied Physics B.Sc. NARS ILOs		Applied Physics B.Sc. Program ILOs						
Intellectual Skills		Intellectual Skills						
		b.1	b.2	b.3	b.4	b.5	a.6	
1	Utilize theories of physics to interpret physical phenomena.	x				x		
2	Apply appropriate physical principles to create and analyze system components.		x				x	
3	Choose optimum solutions for physical problems based on analytical thinking.			x	x			
Applied Physics B.Sc. NARS ILOs		Applied Physics B.Sc. Program ILOs						
Professional and Practical Skills		Professional and Practical Skills						



		c.1	c.2	c.3	c.4	c.5	c.6
1	Apply mathematical tools and techniques to analyze and interpret experimental results.	x	x				
2	Implant comprehensive physical knowledge and understanding as well as intellectual skills in research tasks.				x	x	
3	Use the national standards for laboratory equipment which are essential for practical research work.			x			
4	Present theoretical and experimental results in understandable forms such as tables and graphs.						x
Applied Physics B.Sc. NARS ILOs		Applied Physics B.Sc. Program ILOs					
General Skills		General Skills					
		d.1	d.2	d.3	d.4	d.5	d.6
1	Use information and communication technology effectively.	x					
2	Identify roles and responsibilities, and their performing manner.						x
3	Think independently, set tasks and solve problems on scientific basis.			x			



4	Work in groups effectively; manage time, collaborate and communicate with others positively.		X		X		
5	Consider community linked problems, ethics and traditions.						
6	Acquire self- and long life-learning					X	

Program Coordinator:

Name: Ass. Prof. Mahmoud Hossey
Makled

Signature:

Date:

Head of the Department:

Name: Prof. Dr. Mervat Gamal Elsharawy

Signature:

Date:



Benha University
Faculty of Science

**Special Physics
B.Sc. Program**

2015/2016



Special Physics B.Sc. Program Specification

A. Basic Information

Program Title:	Special Physics B.Sc. Program
Program Type:	Major
Department Responsibility:	Physics Department
Coordinator:	Ass, Prof. Mahmoud H. Makled
Internal Evaluator:	Professor : Efit Eshaaq
External Evaluator:	Professor: Tawfik A. Eldesoky

Assistant Co-ordinator: Name/s of assistant coordinator/s.

Dates of program specifications approval: 9/12/2015

B. Professional Information

1. Program Aims

The special physics program is an academic program produced by Physics Department. It aims to introduce knowledge, experience and practices in Physics ,thus:

The overall aims are to provide the graduate with the following

- The role of Physics and Basic Sciences in the development of society
- Physical facts and theories to analyze and interpret practical data
- Fundamental ideas about the physical behavior of matter and energy to system's structure and function.
- Scientific information and applications in the most of physical branches
- Classification and identification the materials or physical phenomena according physics guidelines and Collection, analyses, and presentation of data using appropriate formats and techniques.
- Graduates are expected to become investigators in industrial or research institutions, scientific reporters, technical consultants, university staff members
- How to develop communication, writing and scientific presentation skills

2. Intended Learning Outcomes (ILO's)

2.1 Knowledge and Understanding



By the end of the program, the graduate will be able to:

- a.1 Investigate the physical facts of (matter, fluids, optics ,energy, nuclear and other physical branches), physical concepts of (thermodynamics, electromagnetism and most of physical phenomena) , physical principles and techniques. .
- a.2 Select and use some of special functions, equations and computer programs to solve the related physical problems according to classical and quantum physics
- a.3 Describe the relation between structure, composition and Physical properties
- a.4 Identify the theoretical and practical aspects of atomic, biophysics, solid state and other related branches in addition to physical phenomena, systems and applications.
- a.5 Memorize the processes and mechanisms supporting the structure, and Physical properties of matter and physical systems.
- a.6 Define microscopic and macroscopic studies for different physical area and physical problems
- a.7 Understand the advanced theories, models, methods and techniques to interpret and analyze data, related to the physical discipline.
- a.8 Understand the essential facts, major concepts, principles, and theories in most basic sciences branches and other sciences to understand the recent advances in Physics

2.2 Intellectual Skills

By the end of the program, the graduate will be able to:

- b.1 Differentiate between the different states of the matter, elements and compounds based on the recognition and quantification of the properties.
- b.2 Organize spacial function, equation , models and programs to exam the validity of the physical laws and analyze system components.
- b.3 Interpret and analyze the practical data and physical properties qualitatively and quantitatively.
- b.4 Solve the physical problems by the appropriate judgments in accordance with physical theories and concepts to choose optimum solutions.
- b.5 Confirm the suitable technique to study crystal structure, fluid mechanics, plasme systems, digital networks. and any physical topic , system and phenomena
- b.6 Modify most of the physical properties of different materials by the modification of structure, composition and synthesis method.

2.3 Skills

2.3.1 Professional and Practical Skills

By the end of the program, the graduate will be able to:



- c.1 Sketch and prepare the physical systems, techniques and data considering physical guidance
- c.2 Analyze the computational programs to interpret the physical and mathematical problems
- c.3 Summarize the practical data according to national standard
- c.4 Collect comprehensive physical knowledge and intellectual skills to solve the physical problems by acceptable methods in research tasks.
- c.5 Judge to apply physics principles and mathematical tools to modern areas of physics research.
- c.6 Able to conduct experiments, techniques and report the theoretical and experimental results in the understandable forms such as tables and graphs.

2.3.2 General Skills

By the end of the program, the graduate will be able to:

- d.1 Use computers and internet for communication, data handling and word processing.
- d.2 Communicate to work efficiently in a team or separately
- d.3 Solve physical problems on scientific basis.
- d.4 Effectively manage tasks, time, and resources.
- d.5 Search for information and engage in life-long self learning discipline.
- d.6 Able to performer, read and interpret scientific literature

3- Academic standards of the program

The program outcomes are derived from National Academic Reference Standards (NARS) for Single programs in Science Faculties (Physics).

4- Reference indices (Benchmarks)

4.1 The program outcomes are derived from National Academic Reference Standards (NARS) for single programs in Science Faculties (Physics).

5- Program structure and contents

a- **Program duration:** four levels (8 semesters)

b- **Program structure:**

Program	Credit hours
Compulsory	118
Optional	18 4



Elective	4
Total	140

Program	Credit hours	Percentage
Basic sciences	33	23.57 %
Humanities (including language)	5	3.57 %
Specialized courses	97	69.29%
Computer and IT	5	3.57%
Total	140	100 %

d- Program Courses:

- Symbols in the list and their meanings

Connotation	Symbol
University requirement	Ur
Faculty requirement	Fr
Botany	B
Chemistry	Ch
Entomology	E
Geology	G
Mathematics	M
Physics	Ph
Zoology	Z

University requirements

The student studies (8 credit hours) at First level



Code No.	Course Title	No. of Units	No. of hours/Week			Level
			Lect	Ex-er.	Prac	
015 Ur	English (1)	2	2	-	-	first
030 Ur	Computer Science (1)	3	2	-	2	first
040 Ur	Computer Science (2)	2	1	-	2	first
050 Ur	Human Rights	1	1	-	-	first

B-Faculty requirements

B1-Compulsory courses

The student studies (18 credit hours) at First level

100 M	General Mathematics (1)	3	2	2	-	first
105 M	General Mathematics (1)	3	2	2	-	first
100 Ph	General Physics (1)	2	2	-	-	first
180 Ph	Practical Physics (1)	1	-	-	3	first
105 Ph	General Physics (2)	2	2	1	-	first
181 Ph	Practical Physics (2)	1	-	-	3	first
100 Ch	General Chemistry (1)	2	2	1	-	first
180 Ch	Practical Chemistry (1)	1	-	-	3	first
105 Ch	General Chemistry (2)	2	2	1	-	first
181 Ch	Practical Chemistry (2)	1	-	-	3	first

B2-Elective courses:

The student studies (6 credit hours) at First level,

183 Ch	Inorganic applied Chemistry(1)	1	-	2	-	first
183 Ph	Applied Physics (1)	1	-	2	-	first
185 Ch	organic applied Chemistry (2)	1	-	2	-	first
185 Ph	Applied Physics (2)	1	-	2	-	First
100 Z	General Zoology (1)	2	1	-	2	first
105 Z	General Zoology (2)	2	1	-	2	first
100 B	General Botany (1)	2	1	-	2	first
105 B	General Botany (2)	2	1	-	2	first
100 G	General Geology (1)	2	1	-	2	first



105 G	General Geology (2)	2	1	-	2	first
111 IN	General Insects (1)	2	1	-	2	first
112 IN	General Insects (1)	2	1	-	2	first
11 Ur	Healthy Nutrition	2	2	-	-	first
12 Ur	History of Sciences	2	2	--	-	first
13 Ur	Healthy nutrition	2	2	-	-	first
14 Ur	Scientific thinking	2	2	-	-	first
17	Labor Law	2	2	-	-	first
19 Ur	Selected subjects from Egypt -----history	2	2	-	-	first

Second level courses

Compulsory courses in First Semester						
223 Ph	Thermodynamics.	3	2	2	-	Second
261 Ph	Electricity, magnetism and AC current	3	3	1	-	Second
271 Ph	Physical Optics and optical fibers	3	3	-	-	Second
275 Ph	Thermodynamics and optics lab.	2	-	-	4	Second
211 M	Advanced calculus	3	2	2	-	Second
Elective one course in First Semester						
251 M	object programming	3	2	2	-	
361 M	Logic circuits	3	2	2	-	
		17	Total credit hours			
Compulsory courses in Second Semester						
212 Ph	waves and oscillations	3	2	2	-	Second



215 Ph	Modern physics	3	2	2	-	Second
256 Ph	Metals, alloys and ceramic physics	3	3	-	-	Second
265 Ph	Electricity, magnetism and AC current lab	2	-	-	4	Second
212 M	Differential equation (1)	3	2	2	-	Second
Elective one course in second Semester						
224 M	Linear Algebra and solid geometry	3	2	2	-	
318 M	Partial differential equation and special functions	3	3	-	-	
		17	Total credit hours			

Third Level Courses

Compulsory courses in First Semester						
311 Ph	Quantum mechanics (1)	3	2	2	-	Third
313 Ph	Statistical physics	3	3	1	-	Third
315 Ph	Modern Physics lab (1)	2	-	-	4	Third
353 Ph	Solid state (1)	3	3	-	-	Third
355 Ph	Solid state lab. (1)	1	-	-	3	Third
361 Ph	Electronics (1)	3	3	-	-	Third
Elective one course in first semester						
323 M	Numerical Analysis	3	3	-	-	
361 M	Logic circuit	3	2	-	2	
		18	Total credit hours			
Compulsory courses in Second Semester						
312 Ph	Theory of electromagnetism and electrodynamics	3	3	1	-	Third
316 Ph	Methods of mathematical physics	2	2	1	-	Third



332 Ph	Plasma physics and applications	3	3	-	-	Third
342 Ph	Nuclear Physics (1)	3	3	-	-	Third
345 Ph	Nuclear Physics Lap (1)	1	-	-	3	Third
354 Ph	Crystal growth and physical properties of crystals	2	2	-	-	Third
365 APh	Electronic Lab (1)	1	-	-	3	Third
Elective one course in Second Semester						
318 M	Partial differential equation and special functions	3	3	-	-	
322 Ch	Inorganic Chemistry	3	3	-	3	
		18	Total credit hours			

Fourth level courses

Compulsory courses in First Semester						
411 Ph	quantum mechanics (2)	3	3	-	-	Fourth
441 Ph	Radiation physics, Radioactive contamination and radiation protection	3	3	-	-	Fourth
451 Ph	Physics of semiconductors and thin films and applications	3	3	-	-	Fourth
453 Ph	Magnetic resonance and spectral Mossbauer	3	3	-	-	Fourth
455 Ph	Semiconductor Lab	1	-	-	3	Fourth
491 Ph	Selected subject in physics (1)	3	3	-	-	Fourth
Elective one course in First semester						
457 Ph	Amorphous and glasses materials	3	3	-	-	Fourth
383 Ph	Fluid mechanics	3	3	1	-	Third
		19	Total credit hours			
Compulsory courses in Second Semester						
400 Ph	Research and Essay	2	2	-	-	Fourth
414 Ph	Modeling of physical systems	3	3	-	-	Fourth



422 Ph	Low temperature and super-conductors	3	3	-	-	Fourth
432 Ph	Atomic and molecular spectrum	3	3	1	-	Fourth
458 Ph	Nano materials physics and application	3	3	-	-	Fourth
472 Ph	Physics of laser and application	3	3	-	-	Fourth
Elective one course in Second Semester						
462 Ph	Mathematical physics using computer	3	3	1	-	
492 Ph	Selected subject in physics (2)	3	3	-	-	
		19	Total credit hours			

Contents of the Courses

See course specification forms

6-

7- Program admission requirements

- Faculty of Benha Science accepts students who have a high school (the scientific branches) or equivalent according to the admission requirements specified by the Supreme Council of Universities.
- Faculty of Benha Science accepts transfer students from other science faculties; provided that the number of credit hours that were studied not more than 50% of the total number of credit hours necessary for his graduation. The student is exempt from the courses studied by successfully whatever their level.

8- Regulations for progression and program completion:

According to the bylaw of the faculty of Benha Science, the regulations for progression and program completion in any discipline single or double re-



as follows: -

- (1) University requirements for a bachelor's degree in any single discipline or double 8 credit hours is mandatory.
- (2) The total requirements for a bachelor's degree in any single discipline or a double is 24 credit hours, including 18 compulsory hours +6 optional hours.
- (3) Specialty requirements for a bachelor's degree in any single discipline or a double is determined by Section 108 certified or relevant departments to specialize hour.
- (4) leads college students summer training for six weeks in the relevant areas of specialization Applied before graduation to not be training only after the student completed 90 credits at least an hour and do not count him credit hours.
- (5) Scientific field trips serve the area of specialization.

▪ **Joining the Program:**

A - Vice Dean for Education and Student Affairs supervises on the implementation of the registration rules and procedures and prepare menus for each of the study groups, schedule, distribute students gentlemen academic advisers, processing cards courses for students which is about cards individual for each course as well as cards total for each student, that academic record data in accredited private records, and the completion of enrollment of students in the first week of the start of the semester.

B - Students may register early, after announcing the results of the end of the spring.

C - Take into account when you log decision student success in Prerequisite if any.

D - A student who was not able to register for compelling reasons approved by the Student Affairs Committee and approved by the College Board to register record late in the additional period for registration (the second week).

E - Student selects one branch to research and essay from two specialized branches.

▪ **Study load:**

Students are allowed to register in at least 14 credit hours and no more than 19 credit hours per semester. With the exception of the following cases:

A - A student can superior (who has a cumulative average of 3 or more) that adds to its two hours, certified in one semester and a maximum of 8 credit hours throughout the study period in decisions, additional optional requirements, specialization departments, college different, that is added appreciation where to CGPA It is not permitted to be an elective requirement for another decision.

B-The College Board may increase the maximum for the academic workload in the last semester of the student up to a maximum of four credit hours to complete graduation requirements.

C - Not allows the student who has a cumulative rate (1) to register in more than 12 credit hours in a semester.

▪ **Additions, deletions, withdraw and modify the path:**

A - Any student after the approval of the academic advisor to add or delete scheduled or two until the end of the second week only study and without prejudice to the burden stipulated.

B - Student may withdraw from the study any decision until the end of the seventh week of the start of registration for the semester with the approval of the academic advisor. The record of this decision in the student's academic record estimate 1 "withdrawn" on the condition that the student does



not have absenteeism overruns before the withdrawal. And cases before the forced withdrawal over this period the Commission Education and Student Affairs for consideration and approval of the Faculty Council on the withdrawal shall be without prejudice boarding school student.

C - A student may alter the course of the specialization subject to the completion of the requirements of specialization desirable and not counting credit hours, which the student obtained by not located in the area of the requirements of the new specialization and after the approval of the academic advisor and the Committee on Education and Student Affairs and the College Board on this amendment.

▪ **Stop registration or drop out**

A - Stop registration: the student can apply to stop his registration for one semester and a maximum of four separate classes are connected and for compelling reasons approved by the College Board.

B - Dropout: the student can re-record if he dropouts for maximum two semesters and for compelling reasons approved by the College Board.

▪ **Attendance:**

A - The instructor shall register the presence of students at the start of each lecture theory or process in a practical period Prepared for by the Student Affairs and delivers this record at the end of the semester to manage the affairs of Students.

B - When the student exceeds the absence of 10% of the scheduled hour's instructor shall notify the Department of Affairs Students to guide the first warning to the student.

C - When the student exceeds the proportion of the absence of 20% of the scheduled hour's instructor shall notify the Department Student Affairs to direct second and final warning to the student.

D - If increased absenteeism 25% of the total scheduled hours and the absence of a student without an acceptable excuse Student Affairs Committee and approved by the College Board, student records estimate" deprived" decision and intervention as a result of failure to calculate the cumulative average of the student.

E - If increased absenteeism was 25% and the absence of the student excuse acceptable to the Commission, Education and Student Affairs and approved by the College Board, student records withdraw from the course.

F - In the case of a request student add a new decision attendance is calculated from the date of registration.

9- Methods and rules of evaluation of students in rolled in the program:

Rating:

The exam is evaluated each courses at 100 degrees and distributed degrees scheduled as follows:

9.1 courses which did not include the part "practical"

Method of Assessment	Weighting	learning outcomes assessed
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Midterm exam & Semester work	10%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final Oral Exam	10 %	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final Term Examination	80%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.

9.2 courses practical separate

Method of Assessment	Weighting	learning outcomes assessed
Mid term exam & Semester work	20%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final Oral Exam	20 %	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final practical Examination	60%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.

9.3 courses which include part "practical"

Method of Assessment	Weighting	learning outcomes assessed
Mid term exam & Semester work	16%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final Oral Exam	12 %	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final practical Examination	24%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.
Final Term Examination	48%	Measure knowledge and understanding (a1 to a8), intellectual (b1 to b6), professional (c1 to c6) and general (d1 to d6) skills.

9.4 Course search and essay



A - 60% of the total score for the course of the various activities carried out by the student during his study of the course.

B- 40% of the total scores for the course of the discussion session

e. Estimated grades and points obtained by the student in each course as follows:

Grade	Symbol	Number of points	Mark
Excellent	A	4	90-100%
	A-	3.7	85-<90%
Very good	B+	3.3	80-<85%
	B	3	75-<80%
Good	B-	2.7	70-<75%
	C+	2.3	65-<70%
Pass	C	2	60-<65%
Failed	F	0	<60%
Absent	F-	0	-

10- Learning resources:

a- Adequacy of laboratories:

The department has 6 student labs which are relatively enough in proportion to the number of students.

- Infra Structure:

- The faculty begin preparing the infra structure of the department through renewing the four student labs exist in the 4st floor of the Physics department. The plan of refurbishing based on repairing the damaged benches Floors and windows, painting walls providing labs with electric fans and enough lights. In addition to replacing the old wallboard into modern one and provide labs with new instruments.

b- Adequacy of Computer facilities

Some of the stuff member's rooms need new PCs.

e- Adequacy of field/practical training resources:

The department arranges 1 Week scientific trip for 3th Year students.

There is summer training by the department itself, and the department provides some stu-



dents

of the third year the chance for summer training at related companies. Some staff members provide students the chance to get their summer training at their labs.

b- Matching of the faculty members specialization to program needs:

Specification Area Status

Good enough.

c- availability and adequacy of program handbook:

Available: $\sqrt{\quad}$ Not Available

d- Adequacy of library facilities:

Adequate: $\sqrt{\quad}$ Not adequate

e- Adequacy of laboratories:

Adequate: $\sqrt{\quad}$ Not adequate

f- Adequacy of computer facilities:

Adequate: $\sqrt{\quad}$ Not adequate

g- Adequacy of field/practical training resources:

Adequate: $\sqrt{\quad}$ Not adequate

11- Quality Management:

a- **effectiveness of the system:** Effective: $\sqrt{\quad}$ Not effective: --

b- **Effectiveness of Faculty and University laws and regulations for progression and completion:** Effective: $\sqrt{\quad}$ Not effective: --

c- **Effectiveness of program external evaluation system:**

i- External evaluators: Effective: $\sqrt{\quad}$ Not effective: --

ii- Students: Effective: $\sqrt{\quad}$ Not effective: --

iii- Other stakeholders: Effective: -- Not effective: --

d- **Faculty response to student and external evaluations:**

Most comments and suggestions of the students and external evaluations were discussed several times during faculty meetings and reviewed by the course instructors and are ap-



plied into the action plan for the next academic year.

12- Proposal for program development

a- Program structure (units/credit hours): credit hours

b- Courses, deletion, additions and modifications: provided in the action plan for the next year

c- **Staff development requirements:** More facilities for different laboratories and resources for the library are required.

I- Phyaics department Plans

13- Progress of the previous year's action plan:

Task	<u>Sectors</u>	Progress of action
Curriculum has to be in the credit hours system to give the student the opportunity to choose what they like in the proper time.	Head of Physics department and all courses instructors	credit hours system has started by the academic year 2010/2011
Refurbishing of three labs in the 4 st floor (fore students and one in the 5 th floor)	Head of Physics department	The four labs were renewed through painting, repairing the damaged floors, benches and windows and are ready to be used.
Purchase some new experimental tools, materials as well as, new scientific systems	Head of Physics department	Several suction and aeration systems were purchased
Purchase some new instruments:	Head of Physics Department_and Dr. Islam Sheha	Electrochemical test station and buttery analyzer



Purchase data show and white screen board for the department		data show and white screen board were purchased
In most cases the lecturer are not using modern means and tools of interactive teaching	Department head and All courses instructors	Many of the courses instructors prepared their courses by power point data presentation
equipping Seminar halls with white boards, projectors or data show and computers.	Department head and All courses instructors	Offering data show computers in the class rooms. Seminar hall not yet arranged
Enhancement of the student field training program	Head of Physics Department and all department staff members	Some staff members provide students the chance to get their summer training at their labs.

13- Next year action plan (2015-2016):

No.	Task	Period	Sectors	Leading responsibility	Cost estimates	Risk Parameters
<u>1</u>	Development of courses: 1- Contents 2- Notes 3- Laboratory equipment's	one year	-All department Stuff members.	-Head of Physics Department	-	-
<u>2</u>	Physics work day	<u>One term</u>	-Head of Physics Department -Prof. <u>Mo-hamed Ali</u>	Head of Physics Department -Dean and vice Dean		No fund or insufficient fund
<u>3</u>	Refurbishing of solid state and Laser research lab	one year	-Head of Physics Department -Prof. <u>Mahmoud Makled and Nabile henday</u>	-Head of Physics Department -Dean and vice Dean	100.000 LE	



Program Coordinators: Prof. Mahmoud H. Makled

Head of the Physics Department: Prof. Mervat Gamal Sharawy

11- Methods of program evaluation:

Evaluator	Tool	Sample
1- Senior Students	Questionnaire	Not less than 25%
2- Alumni	Questionnaire	Not less than 25%
3- Stakeholders	Questionnaire, workshops, seminars, conferences	Representative for all sectors
4- External Evaluators	Reports	Report 1-2
5- Internal Evaluators	Reports	Report 1-2



National Academic Reference Standards (NARS)

Basic Sciences

I. National Academic Reference Standards

1. National Academic Reference Standards

1.1. General Attributes of the Graduates of Basic Sciences

The graduates must be able to:

- 1.1.1. Recognize the role of Basic Sciences in the development of society.
- 1.1.2. Develop scientific approaches that meet community needs considering economic, environmental, social, ethical, and safety requirements.
- 1.1.3. Utilize scientific facts and theories to analyze and interpret practical data.
- 1.1.4. Collect, analyze, and present data using appropriate formats and techniques.
- 1.1.5. Postulate concepts and choose appropriate solutions to solve problems on scientific basis.
- 1.1.6. Apply effectively information technology relevant to the field.
- 1.1.7. Participate effectively in a multidisciplinary teamwork and be flexible for adaptation, decision making and working under contradictory conditions as well as exhibiting the sense of beauty and neatness.
- 1.1.8. Adopt self and long life-learning and participate effectively in research activities.
- 1.1.9. Deal with scientific data in Arabic, English or other languages.

1.2. Knowledge and Understanding

Graduates must acquire knowledge and understanding of:

- 1.2.1. The related basic scientific facts, concepts, principles and techniques.
- 1.2.2. The relevant theories and their applications.
- 1.2.3. The processes and mechanisms supporting the structure and function of the specific topics.
- 1.3. The related terminology, nomenclature and classification systems.
- 1.2.4. The theories and methods applied for interpreting and ana-



lyzing data related to discipline.

1.2.5. The developmental progress of the program-related knowledge.

1.2.6. The relation between the studied topics and the environment.

1.3. Practical and Professional Skills

The graduates must be able to:

1.3.1. Plan, design, process and report on the investigated data, using appropriate techniques and considering scientific guidance.

1.3.2. Apply techniques and tools considering scientific ethics.

1.3.3. Solve problems using a range of formats and approaches.

1.3.4. Identify and criticize the different methods used in addressing subject related issues.

1.4. Intellectual Skills

The graduates must be able to:

1.4.1. Differentiate between subject-related theories and assess their concepts and principles.

1.4.2. Analyze, synthesize, assess and interpret qualitatively and quantitatively science relevant data.

1.4.3. Develop lines of argument and appropriate judgments in accordance with scientific theories and concepts.

1.4.4. Postulate and deduce mechanisms and procedures to handle scientific problems.

1.4.5. Construct several related and integrated information to confirm, make evidence and test hypotheses.

1.5. General and Transferable Skills

The graduates must be able to:

1.5.1. Use information and communication technology effectively.

1.5.2. Identify roles and responsibilities, and their performing manner.

1.5.3. Think independently, set tasks and solve problems on scientific basis.

1.5.4. Work in groups effectively; manage time, collaborate and communicate with others positively.



- 1.5.5. Consider community linked problems, ethics and traditions.
- 1.5.6. Acquire self- and long life–learning.
- 1.5.7. Apply scientific models, systems, and tools effectively.
- 1.5.8. Deal with scientific patents considering property right.
- 1.6.9. Exhibit the sense of beauty and neatness

2. National Academic Reference Standards for Physics

Physics is the study of energy and behavior of single atom and its components. Physics is the foundation upon which the other physical sciences are based such as; astronomy, chemistry and geology. The beauty of physics lies in the simplicity of the fundamental physical theories and assumptions that can alter and expand our view of the world around us. Like all sciences, physics is based on experimental observations and quantitative measurements. The main objective of physics is to use a limited number of fundamental laws that govern natural phenomena to develop theories that can predict the results of future experiment.

Physicists are expected to become investigators in industrial or research institutions. They can also have careers as air navigators and instrument manufacturers, scientific reporters, technical consultants and university staff members. They can also be employed in information technology companies, educational institutions and health care organizations.

2.1. The Attributes of a Physicist

In addition to the general attributes of basic sciences graduates, the physics graduates must be able to:

- 2.1.1. Demonstrate a good basic knowledge of structural and functional aspects of physical systems at many spatial scales, from single molecule to the whole system.
- 2.1.2. Connect fundamental ide- as about the physical be-



havior of matter and energy to system's structure and function.

2.2. Knowledge and Understanding

In addition to the general knowledge acquired by Basic Sciences graduates, the physics graduates must know and understand the:

- 2.2.1. Characteristics and physical properties of matter.
- 2.2.2. Static and dynamic properties of fluids.
- 2.2.3. The Basics of Electricity.
- 2.2.4. Concepts of electromagnetism.
- 2.2.5. Principles of heat transfer and thermodynamics.
- 2.2.6. Theoretical and practical aspects of optics, nuclear physics and other related branches.
- 2.2.7. Application of advanced physical techniques.
- 2.2.8. Basics and mechanisms of energy transfer.

2.3. Practical and Professional skills

In addition to the general skills acquired by Basic Sciences graduates, the physicist must be able to:

- 2.3.1. Apply mathematical tools and techniques to analyze and interpret experimental results.
- 2.3.2. Implant comprehensive physical knowledge and understanding as well as intellectual skills in research tasks.
- 2.3.3. Use the national standards for laboratory equipment which are essential for practical research work.
- 2.3.4. Present theoretical and experimental results in understandable forms such as tables and graphs.



2.4. Intellectual skills

In addition to the general skills acquired by Basic Sciences graduates, the physicist must be able to:

- 2.4.1. Utilize theories of physics to interpret physical phenomena.
- 2.4.2. Apply appropriate physical principles to create and analyze system components.
- 2.4.3. Choose optimum solutions for physical problems based on analytical thinking.



Program Matrixes

Faculty mission vs. Special Physics program design matrix

I. Program attributes vs. faculty mission

Program Aims: The overall aims of the program are to provide the graduate with:		Faculty mission The Faculty of Science, Benha University, confesses and admits to:		
		promote a distinct graduate who will be able to conduct research and innovation that will help him in the labor market competition, taking into account the ethics of the profession,	conduct high-value scientific research that deserves regional and international awareness and publication	recruit human resources and applied research to provide training services and scientific consultation for environmental issues and society development
a	The role of Physics and Basic Sciences in the development of society	√		√
b	Physical facts and theories to analyze and interpret practical data		√	



c	Connect Fundamental ideas about the physical behavior of matter and energy to system's structure and function.	√	√	
d	Scientific information and applications in the most of physical branches	√	√	√
e	Classification and identification the materials or physical phenomena according physics guidelines and Collection, analyses, and presentation of data using appropriate formats and .techniques	√	√	
f	Graduates are expected to become investigators in industrial or research institutions, scientific reporters, technical consultants, university staff members	√	√	√
g	How to develop communication, writing and scientific presentation skills	√	√	√

II. Program Intended Learning Outcomes(ILOs) vs. the faculty mission

a) Knowledge and Understanding

Program Aims: The overall aims of the program are to provide the	Faculty mission The Faculty of Science, Benha University, confesses and admits to:
--	--



graduate with:		promote a distinct graduate who will be able to conduct research and innovation that will help him in the labor market competition, taking into account the ethics of the profession,	conduct high-value scientific research that deserves regional and international awareness and publication	recruit human resources and applied research to provide training services and scientific consultation for environmental issues and society development
a.1	Investigate the physical facts of (matter, fluids, optics, energy, nuclear and other physical branches), physical concepts of (thermodynamics, electromagnetism and most of physical phenomena) , physical principles and techniques. .	√		
a.2	Select and use some of special functions, equations and computer programs to solve the related physical problems according to classical and quantum physics			√
a.3	Describe the relation between structure, composition and Physical properties	√	√	√
a.4	Identify the theoretical and practical aspects of atomic, biophysics, solid state and other related branches in addition to physical phenomena, systems and applications.	√	√	
a.5	Memorize the processes and mechanisms supporting the structure, and Physical properties of matter and physical systems.	√	√	√



a.6	Define microscopic and macroscopic studies for different physical area and physical problems		√	√
a.7	Understand the advanced theories, models, methods and techniques to interpret and analyze data, related to the physical discipline.	√	√	
a.8	Understand the essential facts, major concepts, principles, and theories in most basic sciences branches and other sciences to understand the recent advances in Physics	√	√	√

b) Intellectual Skills

<p>Program Aims: The overall aims of the program are to provide the graduate with:</p>	<p>Faculty mission The Faculty of Science, Benha University, confesses and admits to:</p>		
	<p>promote a distinct graduate who will be able to conduct research and innovation that will help him in the labor market competition, taking into account the ethics of the profession,</p>	<p>conduct high-value scientific research that deserves regional and international awareness and publication</p>	<p>recruit human resources and applied research to provide training services and scientific consultation for environmental issues and society development</p>



b.1	Differentiate between the different states of the matter, elements and compounds based on the recognition and quantification of the properties.	√		
b.2	Organize special function, equation, models and programs to examine the validity of the physical laws and analyze system components.	√	√	
b.3	Interpret and analyze the practical data and physical properties qualitatively and quantitatively.		√	√
b.4	Solve the physical problems by the appropriate judgments in accordance with physical theories and concepts to choose optimum solutions.	√	√	
b.5	Confirm the suitable technique to study crystal structure, fluid mechanics, plasma systems, digital networks, and any physical topic, system and phenomena.	√		√
b.6	Modify most of the physical properties of different materials by the modification of structure, composition and synthesis method.	√	√	√



Program Aims: The overall aims of the program are to provide the graduate with:		Faculty mission The Faculty of Science, Benha University, confesses and admits to:		
		promote a distinct graduate who will be able to conduct research and innovation that will help him in the labor market competition, taking into account the ethics of the profession,	conduct high-value scientific research that deserves regional and international awareness and publication	recruit human resources and applied research to provide training services and scientific consultation for environmental issues and society development
c1.	Sketch and prepare the physical systems, techniques and data considering physical guidance	√	√	
c2.	Analyze the computational programs to interpret the physical and mathematical problems	√	√	√
c3.	Summarize the practical data according to national standard	√	√	√
c4.	Collect comprehensive physical knowledge and intellectual skills to solve the physical problems by acceptable methods in research tasks.	√	√	√
c5.	Judge to apply physics principles and mathematical tools to modern areas of physics research.	√	√	√
C6.	Able to conduct experiments, techniques and report the theoretical and experimental results in the understandable forms such as tables and graphs.	√		√



d) General Skills

Program Aims: The overall aims of the program are to provide the graduate with:		Faculty mission The Faculty of Science, Benha University, confesses and admits to:		
		promote a distinct graduate who will be able to conduct research and innovation that will help him in the labor market competition, taking into account the ethics of the profession,	conduct high-value scientific research that deserves regional and international awareness and publication	recruit human resources and applied research to provide training services and scientific consultation for environmental issues and society development
d1.	Use computers and internet for communication, data handling and word processing.	√	√	
d2.	Communicate to work efficiently in a team or separately	√	√	√
d3.	Solve physical problems on scientific basis.	√	√	
d4.	Effectively manage tasks, time, and resources.	√	√	√
d5.	Search for information and engage in life-long self-learning discipline.	√	√	√
d6.	Able to perform, read and interpret scientific literature	√	√	



**Program aims of Special Physics and attributes of graduate
in Special Physics NARS matrix**

Attributes of graduate in Special Physics NARS		Program aims of Special Physics						
		a	b	c	d	e	f	g
1	Demonstrate a good basic knowledge of structural and functional aspects of physical systems at many spacial scales, from single molecule to the whole system	x			x	x		
2	Connect fundamental ideas about the physical behavior of matter and energy to system's structure and function			x		x		
3	Utilize scientific facts and theories to analyze and interpret practical data				x			
4	Apply effectively information technology relevant to the field							x
5	Develop scientific approaches that meet community needs considering economic, environmental, social, ethical, and safety requirements						x	x
6	Collect, analyze, and present data using appropriate formats and techniques		x					
7	Adopt self and long life-learning and participate effectively in research activities						x	

NARS ILOs matrix&Special Physics B.Sc. Program ILOs

Special Physics B.Sc. NARS ILOs		Special Physics B.Sc. Program ILOs							
		Knowledge and Understanding							
		a.1	a.2	a.3	a.4	a.5	a.6	a.7	a.8
1	Characteristics and physical properties of matter.	x		x		x			
2	Static and dynamic properties of fluids.	x					x		
3	The Basics of Electricity.	x					x		
4	Concepts of electromagnetism.	x							
5	Principles of heat transfer and thermodynamics.	x							
6	Theoretical and practical aspects of optics, nuclear physics and other related branches.				x		x	x	x
7	Appli Application of advanced physical techniques.		x			x		x	x
8	Basics and mechanisms of energy transfer 2.2.8.	x			x		x		

Special Physics B.Sc. NARS ILOs		Special Physics B.Sc. Program ILOs					
		Intellectual Skills					
		b.1	b.2	b.3	b.4	b.5	a.6
1	Utilize theories of physics to interpret physical phenomena.	x				x	
2	Apply appropriate physical principles to create and analyze system components.		x				x
3	Choose optimum solutions for physical problems based on analytical thinking.			x	x		



Special Physics B.Sc. NARS ILOs		Special Physics B.Sc. Program ILOs					
Professional and Practical Skills		Professional and Practical Skills					
		c.1	c.2	c.3	c.4	c.5	c.6
1	Apply mathematical tools and techniques to analyze and interpret experimental results.	x	x				
2	Implant comprehensive physical knowledge and understanding as well as intellectual skills in research tasks.				x	x	
3	Use the national standards for laboratory equipment which are essential for practical research work.			x			
4	Present theoretical and experimental results in understandable forms such as tables and graphs.						x
Special Physics B.Sc. NARS ILOs		Special Physics B.Sc. Program ILOs					
General Skills		General Skills					
		d.1	d.2	d.3	d.4	d.5	d.6
1	Use information and communication technology effectively.	x					



2	Identify roles and responsibilities, and their performing manner.						X
3	Think independently, set tasks and solve problems on scientific basis.			X			
4	Work in groups effectively; manage time, collaborate and communicate with others positively.		X		X		
5	Consider community linked problems, ethics and traditions.						
6	Acquire self- and long life-learning					X	

Program Coordinator:

Name: Prof. Dr. Mahmoud Hosseney
Makled

Signature:

Date:

Head of the Department:

Name: Prof. Dr. Merfit Gamal Elsharawy

Signature:

Date: