SCHOOL OF PHYSICS
UNIVERSITI SAINS MALAYSIA

B. Sc. (Hons.)
[Physics]

School of Physics, USM

2023/2024 ACADEMIC SESSION

B. Sc. (Hons.) [Physics]

SCHOOL OF PHYSICS
UNIVERSITI SAINS MALAYSIA

2023/2024 ACADEMIC SESSION

Vision

Towards global excellence in transdisciplinary research and education in Physics.

Mission

To provide academic, research, educational and social programs for development of human capital knowledge, and technology for sustainable nation.

Background

The School of Physics was set up when the University was established in 1969. The main objective is to produce competent, knowledgeable, creative, and innovative Physics graduates for the nation's rapid growth and progress. To achieve this goal, the School of Physics is offering various relevant programmes and providing many state-of-the-art facilities and know-how for the study of physics and its related disciplines. Apart from lectures, the School of Physics holds regular scientific seminars presented by invited speakers (local and abroad), our own staffs and research students. Outside the campus, we maintain an astronomical observatory in Pantai Acheh, Pulau Pinang designed for applied astronomy research. After the completion of undergraduate study, the students can pursue their higher degrees in the School of Physics.

Among the postgraduate research areas of thrust are:

- Condensed Matter Physics and X-ray Crystallography
- Applied and Engineering Physics
- Energy Studies
- Geophysics, Astronomy and Atmospheric Science
- Theoretical and Computational Physics
- Medical Physics and Radiation Science

Administrative Staff

SCHOOL OF PHYSICS
UNIVERSITI SAINS MALAYSIA

DEAN

PROFESSOR DR. ABDUL RAZAK IBRAHIM

DEPUTY DEANS

ASSOC. PROFESSOR. DR. AZHAR ABDUL RAHMAN
(Research, Innovation & Industry-Community Engagement)

ASSOC. PROFESSOR DR. ISKANDAR SHAHRIM MUSTAFA
(Academic, Career & International)

PROGRAMME CHAIRMAN

ASSOC. PROFESSOR DR. QUAH CHING KHENG
(Applied Physics & Engineering Physics)

ASSOC. PROFESSOR DR. AHMAD FAIRUZ OMAR
(Physics)

DR. RAMZUN MAIZAN RAMLI
(Medical Physics)

DR. ANDY ANDERSON ANAK BERY
(Geophysics)

ADMINISTRATIVE

MR. HAJJAJ JUHARULLAH JAAFAR
(Principal Science Officer)

MR. ZAMZAMI RASIDI
(Principal Assistant Registrar)

MS. EDZUWYN FATHIN HAJI MAHYUDDIN
(Senior Assistant Registrar)

BACHELOR OF SCIENCE WITH HONOURS – PHYSICS

I. Programme Education Objectives (PEOs)

Objectives of the programme:

PEO 1.	Attaining skilled human resource in various aspects of Physics fields.
PEO 2.	Establishing graduates with knowledge and skills in Physics aligning with the industries including electronic industries, research organizations and higher education institutions to fulfil the market demands and needs.
PEO 3.	Producing human capital equipped with logical and critical considerations in the decision making and capable to gain, develop and administer sources of knowledge.
PEO 4.	Developing graduates who appreciate various culture and able to contribute and lead effectively.

II. Programme Learning Outcomes (PLOs)

Upon completion of this programme, the students will be able to:

PLO 1	Knowledge and Understanding	Master the fundamental and advance Physics principles.
PLO 2	Practical Skills	Conduct experiments, analyse, and construe data.
PLO 3	Cognitive	Conclude on a decision using logical reasoning and critical thinking.
PLO 4	Communication Skills	Attain communication skills and teamwork.
PLO 5	Interpersonal Skills	Appreciate culture and cultural diversity, and work in a team.
PLO 6	Ethics and Professionalism	Perform the tasks professionally with values and ethics.
PLO 7	Personal Skills	Locate, assess, and exploit resources independently.
PLO 8	Entrepreneurial Skills	Apply relevant knowledge to administer business model.
PLO 9	Leadership, Autonomy, and Responsibility	Contribute and lead efficiently as a team member to achieve maximum yield.
PLO 10	Digital Skills	Solve Physics problem using computational Physics and other related software.
PLO 11	Numeracy Skills	Perform numerical analysis to solve Physics problems.

III. Programme Structure

Course Components	Credit Unit Requirement
Core (T) – specializing in either one of these three tracks: **1. Pure Physics (PP)** **2. Electronics and Semiconductor (ES)** **3. Optics and Photonics (OP)**	72
[A] Elective (E) or **[B] Minor (M) and Elective (E)#**	30 or (M) and (E) (16 or 20) and (14 or 10)
University (U)	18
Total units	120

#Students may choose a Bachelor of Science Degree with combination of either [A] Major in Physics taken with Elective Courses or [B] Major in Physics taken with Minor Area of Specialization Programme (see Section IV)

Note:
A student must attain a minimum CGPA of 2.0 ('C' average) for the whole 120 units AND must attain a minimum CGPA of 2.0 for the Core courses

IV. Minor Area of Specialisation (B. Major with Minor)

* Select from any of the Minor programmes offered, which include Astronomy (offered by the School of Physics), Chemistry, Mathematics, Computer Science, Management, Islamic Studies, and English Language, but not limited to these.
* Students need to pass 16 or 20 units of courses taken under Minor area of specialisation (refer to the School concerned for more information on the courses offered).
* The remainder 14 or 10 units are to be selected from the list of elective courses for this programme (see Section VII).

V. Industrial Training

* It is OPTIONAL, but **highly encouraged**.
* Duration is 24 weeks, to be taken during Semester 2 of your 4th year of study.
* Purpose is to strengthen the relationship between the University and the private and public sectors and provide exposure to working-life for students nearing their completion of undergraduate study.
* Students in the final year to serve as trainees with various employers in industries, hospitals, or institutions relevant to their fields of study through the School of Physics.
* Evaluation is based on the reports from the industrial and field supervisors, reports by the students themselves, and the student's presentation.
* Students may opt out Industrial Training provided substitute courses are taken with total unit equivalent to 12 of courses at the 400 level (see Section VII).

VI. List of Core Courses

B.Sc. (Hons.) [Physics]– Pure Physics Track (PP)				
Core courses (T) – total 72 units; Compulsory (22 courses)				
No.	Course Code	Title	Pre-requisite	Sem
1.	ZCA 101/4	Mechanics		1
2.	ZCA 102/4	Electricity and Magnetism I	(S) ZCA 101/4	2
3.	ZCT 103/3	Vibrations, Waves, and Optics		1
4.	ZCT 104/3	Modern Physics		2
5.	ZCT 106/3	Electronics I	(C) ZCA 102/4	2
6.	ZCA 110/4	Calculus		1
7.	ZCT 112/3	Linear Algebra and Vector Analysis	(S) ZCA 110/4 or (S) MAA 101/4	2
8.	ZCT 191/2	Physics Practical I		1
9.	ZCT 192/2	Physics Practical II		2
10.	ZCT 205/3	Quantum Mechanics	(S) ZCT 104/3	2
11.	ZCT 206/3	Electronics II	(S) ZCT 106/3	1
12.	ZCT 210/4	Complex Analysis and Differential Equations	(S) ZCA 110/4 or (S) MAA 101/4	1
13.	ZCT 215/3	Optics	(S) ZCT 103/3	1
14.	ZCT 293/2	Physics Practical III	(S) ZCT 191/2 or (S) ZCT 192/2	1
15.	ZCT 307/3	Solid State Physics I	(S) ZCT 205/3	1
16.	ZCT 398/8	Physics Project (two semesters)	(S) ZCT 293/2 (ES) or (S) ZCT 294/2 (PP) or (S) ZKT 296/2 (OP)	
Core Courses – Pure Physics Track Specialization				
17.	ZCT 214/3	Thermodynamics	(S) ZCA 102/4	1
18.	ZCT 219/4	Mathematical Methods	(S) ZCT 112/3 and (S) ZCT 210/4	2
19.	ZCT 294/2	Physics Practical IV	(S) ZCT 191/2 or (S) ZCT 192/2	2
20.	ZCT 304/3	Electricity and Magnetism II	(P) ZCA 102/4 and (S) ZCT 112/3 and (S) ZCT 210/4	2
21.	ZCT 314/3	Statistical Mechanics	(S) ZCT 214/3	1
22.	ZCT 317/3	Solid State Physics II	(S) ZCT 307/3	2

All the courses offered are subject to changes should the need arise.

Note:
P: Pass (Grade C and above)
S: Sequential (course must be taken earlier)
C: Concurrent (courses must be taken concurrently)

B.Sc. (Hons.) [Physics]– Electronics & Semiconductor Track (ES)				
Core courses (T) – total 72 units; Compulsory (21 courses)				
No.	Course Code	Title	Pre-requisite	Sem
1.	ZCA 101/4	Mechanics		1
2.	ZCA 102/4	Electricity and Magnetism I	(S) ZCA 101/4	2
3.	ZCT 103/3	Vibrations, Waves and Optics		1
4.	ZCT 104/3	Modern Physics		2
5.	ZCT 106/3	Electronics I	(C) ZCA 102/4	2
6.	ZCA 110/4	Calculus		1
7.	ZCT 112/3	Linear Algebra and Vector Analysis	(S) ZCA 110/4 or (S) MAA 101/4	2
8.	ZCT 191/2	Physics Practical I		1
9.	ZCT 192/2	Physics Practical II		2
10.	ZCT 205/3	Quantum Mechanics	(S) ZCT 104/3	2
11.	ZCT 206/3	Electronics II	(S) ZCT 106/3	1
12.	ZCT 210/4	Complex Analysis and Differential Equations	(S) ZCA 110/4 or (S) MAA 101/4	1
13.	ZCT 215/3	Optics	(S) ZCT 103/3	1
14.	ZCT 293/2	Physics Practical III	(S) ZCT 191/2 or (S) ZCT 192/2	1
15.	ZCT 307/3	Solid State Physics I	(S) ZCT 205/3	1
16.	ZCT 398/8	Physics Project (two semesters)	(S) ZCT 293/2 (ES) or (S) ZCT 294/2 (PP) or (S) ZKT 296/2 (OP)	
Core Courses – Electronics and Semiconductor Track Specialization				
17.	ZAT 281/4	Introduction to Microprocessors	(P) ZCT 206/3	2
18.	ZAT 283/3	Instrumentation	(S) ZCT 206/3 and (S) ZCT 293/2	2
19.	ZAT 386/4	Physics of Semiconductor Devices	(S) ZCT 106/3 and (S) ZCT 307/3	2
20.	ZAT 487/4	Semiconductor Fabrication Processes	(S) ZAT 386/4	1
21.	ZAT 489/3	Low Dimensional Semiconductor Structures	(S) ZCT 307/3	1

All the courses offered are subject to changes should the need arise.

Note:
P: Pass (Grade C and above)
S: Sequential (course must be taken earlier)
C: Concurrent (courses must be taken concurrently)

B.Sc. (Hons.) [Physics]– Optics & Photonics Track (OP)				
Core courses (T) – total 72 units; Compulsory (22 courses)				
No.	Course Code	Title	Pre-requisite	Sem
1.	ZCA 101/4	Mechanics		1
2.	ZCA 102/4	Electricity and Magnetism I	(S) ZCA 101/4	2
3.	ZCT 103/3	Vibrations, Waves and Optics		1
4.	ZCT 104/3	Modern Physics		2
5.	ZCT 106/3	Electronics I	(C) ZCA 102/4	2
6.	ZCA 110/4	Calculus		1
7.	ZCT 112/3	Linear Algebra and Vector Analysis	(S) ZCA 110/4 or (S) MAA 101/4	2
8.	ZCT 191/2	Physics Practical I		1
9.	ZCT 192/2	Physics Practical II		2
10.	ZCT 205/3	Quantum Mechanics	(S) ZCT 104/3	2
11.	ZCT 206/3	Electronics II	(S) ZCT 106/3	1
12.	ZCT 210/4	Complex Analysis and Differential Equations	(S) ZCA 110/4 or (S) MAA 101/4	1
13.	ZCT 215/3	Optics	(S) ZCT 103/3	1
14.	ZCT 293/2	Physics Practical III	(S) ZCT 191/2 or (S) ZCT 192/2	1
15.	ZCT 307/3	Solid State Physics I	(S) ZCT 205/3	1
16.	ZCT 398/8	Physics Project (two semesters)	(S) ZCT 293/2 (ES) or (S) ZCT 294/2 (PP) or (S) ZKT 296/2 (OP)	
Core Courses – Optics and Photonics Track Specialization				
17.	ZKT 224/3	Electronic and Photonic Materials	(S) ZCT 106/3 and (S) ZCT 210/4	2
18.	ZKT 244/4	Workshop Training and Product Design	(S) ZCT 192/2	2
19.	ZKT 245/3	Optical Fiber and Photonic Devices	(S) ZCT 106/3 and (S) ZCT 215/3	2
20.	ZKT 296/2	Photonics Laboratory	(S) ZCT 293/2	2
21.	ZKT 327/3	Solid State Lighting	(C) ZCT 307/3	1
22.	ZAT 489/3	Low Dimensional Semiconductor Structures	(S) ZCT 307/3	1

All the courses offered are subject to changes should the need arise.

Note:
P: Pass (Grade C and above)
S: Sequential (course must be taken earlier)
C: Concurrent (courses must be taken concurrently)

VII. List of Elective Courses (all three tracks)

Electives courses (E) – need 30 units (A. Major with Elective)				
(a) Select all 30 units from here or select 26 units and the remaining 4 units from Part (b)				
No.	Course Code	Title	Pre-requisite	Sem
1.	ZCE 111/4	Computational Approach in Physics Learning		2
2.	ZCE 208/3	Classical Mechanics	(P) ZCA 101/4 and (P) ZCA 110/4 and (S) ZCT 112/3 and (S) ZCT 210/4	2
3.	ZCE 275/4	Introduction to Astronomy		1
4.	ZCE 277/4	Structure of the Universe		2
5.	ZAE 282/3	Materials Science	(C) ZCT 214/3	1
6.	ZCE 305/3	Atomic and Nuclear Physics	(S) ZCT 205/3	1
7.	ZCE 321/3	The Engineer in Society		1
8.	ZME 336/4	Medical Instrumentation	(S) ZCT 106/3	1
9.	ZCE 341/4	Energy Studies	(S) ZCA 101/4 and (S) ZCA 102/4	2
10.	ZGT 374/4	Remote Sensing	(S) ZCA 102/4 and (S) ZCT 103/3	1
11.	ZCE 376/4	Astronomy Principles and Practices		1
12.	ZCE 378/4	Introduction to Radio Astronomy		2
13.	ZMT 431/4	Radiation Biophysics	(S) ZCT 104/3	1
14.	ZME 432/4	Medical Laser	(S) ZCT 104/3	2
15.	ZME 438/4	Physics of Medical Imaging	(S) ZCT 106/3	1
16.	ZCE 451/3	X-Ray Analysis	(C) ZCT 307/3	1
17.	ZAE 484/4	Laser Technology and Its Application	(S) ZCT 104/3	2
18.	ZAE 485/4	Applied Spectroscopy	(S) ZCT 215/3	1
19.	ZAE 488/4	Non-Destructive Testing	(S) ZCT 104/3	2
20.	ZCE 499/12	Industrial Training	(S) ZCT 398/8 or (S) ZMT 397/8 or (S) ZGT 395/8	2
(b) Recommended selection (but not limited to these) from other Science or Applied Science programmes[£], not from the School of Physics (maximum 4 units)				
21.	MAA 161/4	Statistics for Science Students		

[£] For details, refer to the School concerned

All the courses offered are subject to changes should the need arise.

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B. Sc. (Hons.)
[Physics]


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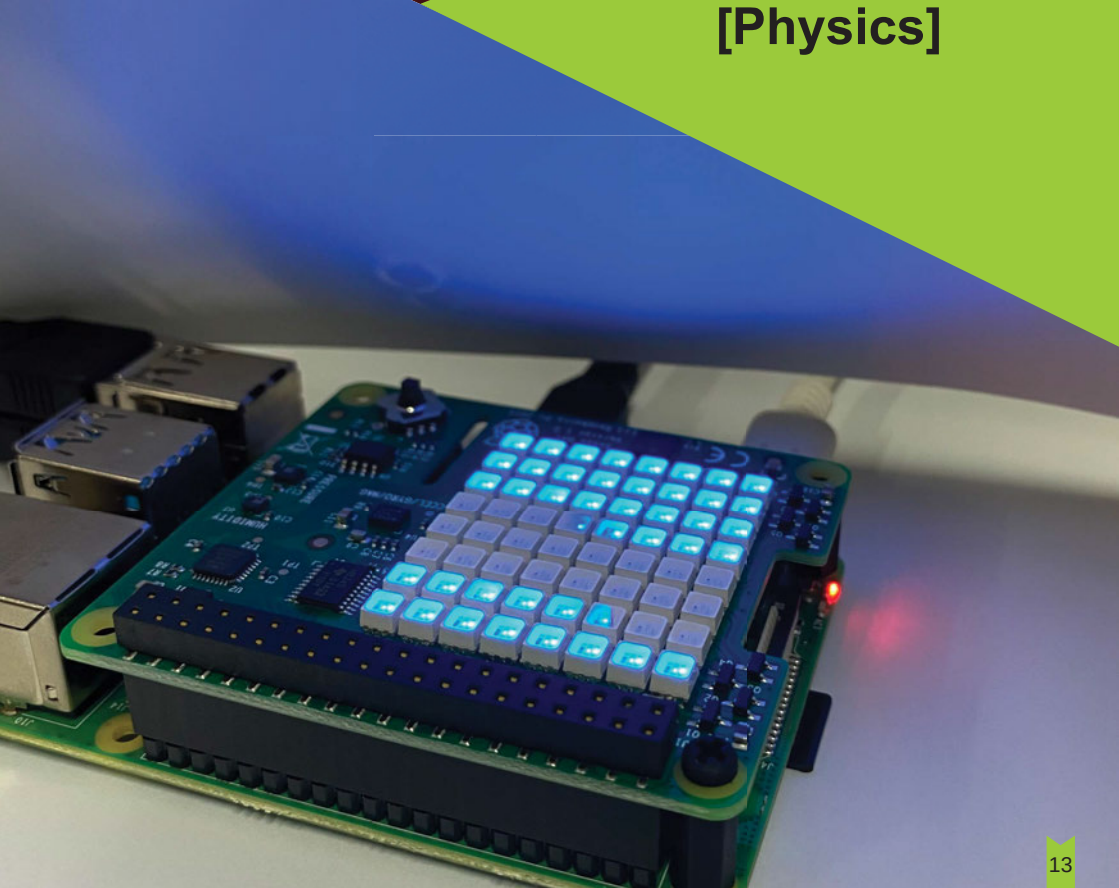
B. Sc. (Hons.)
[Physics]



VIII. Recommended Schedule by Semester

B.Sc. (Hons.) [Physics]– Pure Physics Track

	YEAR 1				YEAR 2				YEAR 3				YEAR 4				
	SEM 1		SEM 2		SEM 1		SEM 2		SEM 1		SEM 2		SEM 1		SEM 2		
COMPONENTS	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Cr**
Core courses (T)	ZCA 101	4	ZCA 102	4	ZCT 206	3	ZCT 205	3	ZCT 307	3	ZCT 304	3					72
	ZCT 103	3	ZCT 104	3	ZCT 210	4	ZCT 219	4	ZCT 314	3	ZCT 317	3					
	ZCA 110	4	ZCT 106	3	ZCT 214	3	ZCT 294	2	ZCT 398	4	ZCT 398	4					
	ZCT 191	2	ZCT 112	3	ZCT 215	3											
			ZCT 192	2	ZCT 293	2											
Elective (E) or Minor (M) courses									#	4	#	4	#	4	ZCE 499 or @	12	30
									#	3			#	3			
University courses (U)	*WUS 101*	2	U*	2	*HFF 225*	2	*HFE 224*	2	U*	2	U*	4	U*	4			18
Total Credit Hours		15		17		17		11		19		18		11		12	**120**

Note:

U* : for details, see Chapter 3 of the BPRP

: Choose any from Part VII List of Elective Courses, and Minor courses if relevant

@ : Choose any 400 level courses from Part VII List of Elective Courses

B.Sc. (Hons.) [Physics]– Electronics & Semiconductor Track

	YEAR 1				YEAR 2				YEAR 3				YEAR 4				
	SEM 1		SEM 2		SEM 1		SEM 2		SEM 1		SEM 2		SEM 1		SEM 2		
COMPONENTS	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Cr**
Core courses (T)	ZCA 101	4	ZCA 102	4	ZCT 206	3	ZCT 205	3	ZCT 307	3	ZAT 386	4	ZAT 487	4			72
	ZCT 103	3	ZCT 104	3	ZCT 210	4	ZAT 281	4	ZCT 398	4	ZCT 398	4	ZAT 489	3			
	ZCA 110	4	ZCT 106	3	ZCT 215	3	ZAT 283	3									
	ZCT 191	2	ZCT 112	3	ZCT 293	2											
			ZCT 192	2													
Elective (E) or Minor (M) courses									#	4	#	4	#	4	ZCE 499 or @	12	30
									#	3	#	3					
University courses (U)	*WUS 101*	2	U*	2	*HFF 225*	2	*HFE 224*	2	U*	2	U*	4	U*	4			18
Total Credit Hours		15		17		14		12		16		19		15		12	**120**

Note:

U* : for details, see Chapter 3 of the BPRP

: Choose any from Part VII List of Elective Courses, and Minor courses if relevant

@ : Choose any 400 level courses from Part VII List of Elective Courses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B.Sc. (Hons.) [Physics]– Optics & Photonics Track

	YEAR 1				YEAR 2				YEAR 3				YEAR 4				
	SEM 1		SEM 2		SEM 1		SEM 2		SEM 1		SEM 2		SEM 1		SEM 2		
COMPONENTS	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Code**	**Cr**	**Cr**
Core courses (T)	ZCA 101	4	ZCA 102	4	ZCT 206	3	ZCT 205	3	ZCT 398	4	ZCT 398	4	ZAT 489	3			72
	ZCT 103	3	ZCT 104	3	ZCT 210	4	ZKT 224	3	ZCT 307	3							
	ZCA 110	4	ZCT 106	3	ZCT 215	3	ZKT 244	4	ZKT 327	3							
	ZCT 191	2	ZCT 112	3	ZCT 293	2	ZKT 245	3									
			ZCT 192	2			ZKT 296	2									
Elective (E) or Minor (M) courses									#	4	#	4	#	4	ZCE 499 or @	12	30
											#	3	#	3			
University courses (U)	*WUS 101*	2	U*	2	*HFF 225*	2	*HFE 224*	2	U*	2	U*	4	U*	4			18
Total Credit Hours		15		17		14		17		16		15		14		12	**120**

Note:

U* : for details, see Chapter 3 of the BPRP

: Choose any from Part VII List of Elective Courses, and Minor courses if relevant

@ : Choose any 400 level courses from Part VII List of Elective Courses

NOTE

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NOTE

UNIVERSITI SAINS MALAYSIA

RANKED 137TH QS WORLD UNIVERSITY RANKINGS 2024

RANKED 4TH IN THE WORLD Times Higher Education Impact Rankings 2023

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