
BACHELOR OF SECONDARY EDUCATION **Major in Science**

Program Description

The Bachelor of Secondary Education major in Science program is designed to equip learners with adequate and relevant competencies to teach Science in the secondary level. It aims to develop highly motivated and competent Science teachers specializing in the content and pedagogy for secondary education.

Program Educational Objectives:

Within three to five years after obtaining a bachelor's degree in secondary education Major in Science graduates are expected to:

1. Demonstrate mastery of content and research- based knowledge and its application within and across curriculum areas along with a sound and critical understanding of the application of theories and principles of teaching and learning and the ability to translate curriculum content into relevant learning activities.
2. Display proficiency in Mother Tongue, Filipino and English in the teaching and learning process and needed skills in the use of communication strategies, teaching strategies, assessment tools and strategies, and ICT to promote high quality learning outcomes.
3. Establish learning environments that are safe, secure, fair, and supportive to engage learners in meaningful activities, and responsive to learner diversity.
4. Manifest life-long commitment to improve practice through active participation in professional networks, engagement in research and extension, and postgraduate studies.
5. Uphold professional ethics, accountability and transparency to promote professional and harmonious relationships with learners, parents, colleagues, superiors, and the wider community as well as manifest understanding and application of the Lasallian principles of education in their practice.

Program Outcomes

By the time of graduation, the students of the program shall have develop the ability to:

1. Display skills and abilities to be a reflective and research-oriented life-long learner capable of articulating and syn-thesizing new knowledge in the specific field of practice
2. Articulate thoughts and ideas effectively and responsibly, in English and in Filipino, in both spoken and written modes, for various purposes and audiences
3. Work effectively and collaboratively with colleagues in a mul-ticultural environment by maintaining respect of individual differences to sustain a Christian working relationship, real-izing the Lasallian mission
4. Act in recognition of professional, social, and ethical re-sponsibility in a Lasallian way, through establishing smooth interpersonal relationships with others by taking responsibil-ity and accountability for actions, a positive attitude to-wards learning, and the concern for the preservation and protection of the environment
5. Engage collaboratively to preserve and promote Filipino his-torical and cultural heritage and to respect cultural diversity to contribute in the transformation of the community's situa-tion for the better
6. Articulate the rootedness of education in philosophical, so-cio-cultural,

- historical, psychological, political, and Lasallian context in order to gain deeper understanding and wider perspectives of educational issues that have implications to students, society, environment, and Church
7. Facilitate learning using a wide range of teaching methodologies including the responsible use of ICT in various delivery modes appropriate to specific learners and their environment
 8. Manifest mastery of subject matter/discipline and continued discovery of new knowledge by applying appropriate and relevant multidisciplinary approaches to problem solving tasks through technology and innovative methods
 9. Develop innovative curricula, instructional plans, teaching approaches, and resources for diverse learners done through investigative skills alongside self-reflection
 10. Apply innovative skills in the development and utilization of ICT to promote quality, relevant, and sustainable Christian educational practices significant to the society
 11. Demonstrate a variety of thinking skills in planning, monitoring, assessing, and reporting learning processes and outcomes for the improvement of teaching-learning activities
 12. Apply provisions of the Code of Ethics for Teachers vis-à-vis Lasallian Guiding Principles to come up with educationally sound decisions and solutions that benefit the self, community, country and world
 13. Pursue Continuing Professional Education (CPE) and deepen personal development to enrich the profession and make it useful to the church and society
 14. Exhibit deep understanding of the key core ideas, concepts, and principles in major science disciplines and of the nature of scientific inquiry so they be guided in analyzing situations leading to well-discerned decisions expressed in different modes of communication
 15. Utilize the process of scientific inquiry in dealing with issues related to teaching, learning, leading, and living coupled with self-reflection in search for sustainable solutions to a particular problem that affect the society and the environment
 16. Utilize effective science teaching strategies, appropriate assessment tools, methods and reporting, and positive learning environment attentive to students in their uniqueness
 17. Manifest meaningful and comprehensive pedagogical content knowledge (PCK) of the sciences in the conduct of science investigation, model-making and prototype, and doing science research in order to promote learner's skills in discovery learning, problem learning, creativity, and critical thinking.

SUMMARY OF REQUIRED COURSES OF BSEd IN SCIENCE

	No. of Courses	Unit Equivalent	Total Units
General Education Courses			
Core Courses			
Understanding the Self	1	3	
Readings in Philippine History	1	3	
The Contemporary World	1	3	
Mathematics in the Modern World	1	3	
Purposive Communication	1	3	
Art Appreciation	1	3	
Science, Technology, and Society	1	3	
Ethics	1	3	24
Elective Courses			
Philippine Indigenous Communities	1	3	
Environmental Science	1	3	
Religions, Religious Experiences and Spirituality	1	3	9
Mandated Courses			
Life and Works of Rizal	1	3	
Physical Education	4	8	
National Service Training Program	2	6	17
Institutional Courses			
Religious Studies	2	6	
Group Guidance	1	1.5	
Public Speaking in the Discipline	1	3	
Logic	1	3	13.5
Professional Education Courses			
Foundation/Theories and Concepts			
The Child and Adolescent Learners and Learning Principles	1	3	
The Teaching Profession	1	3	
The Teacher and the Community, School Culture & Organizational Leadership	1	3	
Foundation of Special and Inclusive Education	1	3	12
Pedagogical Content Knowledge			
Facilitating Learner-Centered Teaching and Learning	1	3	
Assessment in Learning 1	1	3	
Assessment in Learning 2	1	3	
Technology for Teaching and Learning 1	1	3	
The Teacher and the School Curriculum	1	3	
Building and Enhancing New Literacies Across the Curriculum	1	3	18
Experiential Learning			
Field Study 1 (Observations Teaching-Learning in Actual School Environment)	1	3	
Field Study 2 (Participation and Teaching Assistantship)	1	3	
Teaching Internship	1	6	12
LET Preparatory Courses			
Intensive LET Preparatory Course 1 (General Education & Professional Education Courses)	1	3	
Intensive LET Preparatory Course 2 (Specialization)	1	3	6

Major Courses

Genetics (with Lab)	1	4	
Cell and Molecular Biology (with Lab)	1	4	
Microbiology and Parasitology (with Lab)	1	4	
Anatomy and Physiology (with Lab)	1	4	
Inorganic Chemistry (with Lab)	1	5	
Organic Chemistry (with Lab)	1	5	
Biochemistry	1	3	
Analytical Chemistry (with Lab)	1	5	
Thermodynamics (with Lab)	1	4	
Modern Physics	1	3	
Electricity and Magnetism (with Lab)	1	4	
Waves and Optics (with Lab)	1	4	
Fluid Mechanics	1	3	
Earth Science	1	3	
Astronomy	1	3	
Environmental Science	1	3	
The Teaching of Science	1	3	
Technology for Teaching and Learning 2	1	3	
Research in Teaching	1	3	
Meteorology	1	3	73
Total Units			184.5

**BACHELOR OF SECONDARY EDUCATION
Major in Science**
FIRST YEAR
First Semester

		Lec Units	# of hrs/wk	Lab Units	# of hrs/wk	Total Credit Units	Total Assessed Units
RHIST	Readings in Philippine History	3	3	0	0	3	3
USELF	Understanding the Self	3	3	0	0	3	3
PCOM	Purposive Communication	3	3	0	0	3	3
IRS1	Lasallian Spirituality	3	3	0	0	3	3
PED1	Physical Education 1 (Wellness and Fitness)	2	2	0	0	2	2
NSTP1	National Service Training Program 1	3	3	0	0	3	3
ARTAP	Art Appreciation	3	3	0	0	3	3
EDCN101	The Child and Adolescent Learner and Learning Principles	3	3	0	0	3	3
EDCN102	Facilitating Learner-Centered Teaching	3	3	0	0	3	3
	Total	26	26	0	0	26	26

Second Semester

		Lec Units	# of hrs/wk	Lab Units	# of hrs/wk	Total Credit Units	Total Assessed Units
MATHMW	Mathematics in the Modern World	3	3	0	0	3	3
STS	Science, Technology, and Society	3	3	0	0	3	3
ENSCI	Environmental Science	3	3	0	0	3	3
RIZAL	Life and Works of Rizal	3	3	0	0	3	3
IRS2	Lasallian Formation on Christian Morality	3	3	0	0	3	3
PED2	Physical Education 2 (Team Sports and Rhythmic Activities)	2	2	0	0	2	2
IGG	Group Guidance	1.5	1.5	0	0	1.5	1.5
NSTP2	National Service Training Program 2	3	3	0	0	3	3
EDCN103	The Teaching Profession	3	3	0	0	3	3
EDCN104	Technology for Teaching and Learning 1	3	3	0	0	3	3
	Total	27.5	27.5	0	0	27.5	27.5

SECOND YEAR
First Semester

		Lec Units	# of hrs/wk	Lab Units	# of hrs/wk	Total Credit Units	Total Assessed Units
PICO	Philippine Indigenous Communities	3	3	0	0	3	3
PED3	Physical Education 3 (Swimming and Recreation)	2	2	0	0	2	2
PSPEAK	Public Speaking in the Disciplines	3	3	0	0	3	3
EDCN105	Assessment in Learning 1	3	3	0	0	3	3
EDCN106	The Teacher and the School Curriculum	3	3	0	0	3	3
SCI201	Cell & Molecular Biology (with Lab)	3	3	1	2	4	5
SCI202	Chem1: Inorganic Chemistry (with Lab)	3	3	2	3	5	6
SCI203	Phys1: Fluid Mechanics	3	3	0	0	3	3
	Total	23	23	3	5	26	28

Second Semester

		Lec Units	# of hrs/wk	Lab Units	# of hrs/wk	Total Credit Units	Total Assessed Units
IRS3E	Religions, Religious Experiences and Spirituality	3	3	0	0	3	3
CWRLD	The Contemporary World	3	3	0	0	3	3
ETHICS	Ethics	3	3	0	0	3	3
PED4	Physical Education 4 (Individual and Dual Sports)	2	2	0	0	2	2
LOGIC	Logic	3	3	0	0	3	3
EDCN107	Assessment in Learning 2	3	3	0	0	3	3

EDCN108	The Teacher and the Community, School Culture & Organizational Leadership	3	3	0	0	3	3
SCI204	Chem2: Analytical Chemistry (with Lab)	3	3	2	3	5	6
SCI205	Phys2: Thermodynamics (with Lab)	3	3	1	2	4	5
	Total	26	26	3	5	29	31

THIRD YEAR

First Semester

		Lec Units	# of hrs/wk	Lab Units	# of hrs/wk	Total Credit Units	Total Assessed Units
EDCN109	Foundation of Special and Inclusive Education	3	3	0	0	3	3
EDCN110	Building and Enhancing New Literacies Across the Curriculum	3	3	0	0	3	3
SCI206	Bio2: Genetics (with Lab)	3	3	1	2	4	5
SCI207	Chem3: Organic Chemistry (with Lab)	3	3	2	3	5	6
SCI208	Phys3: Electricity and Magnetism (with Lab)	3	3	1	2	4	5
SCI209	Earth Science	3	3	0	0	3	3
SCI210	Environmental Science 2	4	4	0	0	3	3
SCI211	Meteorology	4	4	0	0	3	3
	Total	26	26	4	7	28	31

Second Semester

		Lec Units	# of hrs/wk	Lab Units	# of hrs/wk	Total Credit Units	Total Assessed Units
SCI212	Bio3: Microbiology and Parasitology (with Lab)	3	3	1	2	4	5
SCI213	Phys4: Waves and Optics (with Lab)	3	3	1	2	4	5
SCI214	Phys5: Modern Physics	3	3	0	0	3	3
SCI215	Bio4: Anatomy and Physiology (with Lab)	3	3	1	2	4	5
SCI216	Astronomy	3	3	0	0	3	3
SCI217	The Teaching of Science	3	3	0	0	3	3
SCI218	Research in Teaching Science	3	3	0	0	3	3
SCI219	Chem4: Biochemistry	3	3	0	0	3	3
	Total	24	24	3	6	27	30

FOURTH YEAR

First Semester

		Lec Units	# of hrs/wk	Lab Units	# of hrs/wk	Total Credit Units	Total Assessed Units
EDCN111	Field Study 1 (Observations Teaching -Learning in Actual School Environment)	3	3	0	0	3	3
EDCN112	Field Study 2 (Participation and Teaching Assistantship)	3	3	0	0	3	3
EDCN114	Intensive LET Preparatory Course 1 (General Education & Professional Education Courses)	3	14	0	0	3	3
SCI220	Technology for Teaching and Learning 2 (Science)	3	3	0	0	3	3
	Total	12	23	0	0	12	12

Second Semester

		Lec Units	# of hrs/wk	Lab Units	# of hrs/wk	Total Credit Units	Total Assessed Units
EDCN113	Teaching Internship	6	30	0	0	6	6
EDCN115	Intensive LET Preparatory Course 2 (Specialization)	3	7	0	0	3	3
	Total	9	37	0	0	9	9

MAJOR COURSE DESCRIPTIONS
Bachelor of Secondary Education
Major in Science**SCI201** **4 units**
BIO1: CELL AND MOLECULAR BIOLOGY (with LAB)

This course deals with the study of the structure and function of cellular organelles and inclusions including the relationship between cell and structure and biochemical reactions. It also includes basic discussions on the central dogma of molecular biology and updates on DNA technology. The laboratory course deals with the enhancement of skills for the use of laboratory equipment in the study of the structure and function of organelles. It also includes investigations of cellular processes through chromatography, centrifugation, spectrophotometry, and electrophoresis.

For students to better understand the function and importance of each organelle or inclusion, they will personify assigned part in a role play where concepts of biotechnology, nanotechnology, important cellular metabolism, or cellular activity are also integrated.

SCI202 **5 units**
CHEM1: INORGANIC CHEMISTRY (with LAB)

This course covers fundamental concepts of chemical kinetics, chemical equilibrium (including acid-base chemistry and solubility equilibrium), thermodynamics, and electrochemistry. It also deals with solution chemistry, specifically reactions in aqueous solutions as well as group properties and reactions of elements as an introduction to qualitative analysis of cations and anions.

The students, while learning the concepts, will participate in various activities in a series of games and challenges in a semester-long ChemOlympics. These games will challenge them to work in collaboration with their team members and utilize higher order thinking skills in winning the games. Their laboratory activity will culminate with a product-testing investigation where they could apply the basic and advanced science process skills and the results of which will be presented at the end of the semester.

SCI203 **3 units**
PHYS1: FLUID MECHANICS

This course deals with the science of fluids (liquids and gases). It discusses aerodynamics- the study of air and gases in motion; and hydrodynamics- the study of liquids in motion. It discusses principle relating speed, pressure and forces particularly Bernoulli and Pascal's principles. It allows the students to gain knowledge of how this topic is applied to daily activities and solve practical problems. The students will solve hydrostatic problems relevant to everyday life describing the physical properties of given fluid, its motion and its interaction of hydrostatic pressure, buoyant force and other forces involved to explain common natural phenomena.

For classroom teaching application, they are to work in teams where they are to solve given problems by coming up with effective and efficient designs and structures applying their learned concepts of fluid dynamics.

SCI204 **5 units**
CHEM2: ANALYTICAL CHEMISTRY (with LAB)

The course involves a study of the principles and theories important to the practice of analytical chemistry. It involves a discussion of the techniques, methods and instrumentation involved in determining the amount of constituents in samples. Particular attention is given to stoichiometric problems. The laboratory work covers calibration of instruments, volumetric and gravimetric methods especially those analyses encountered in industries. Emphasis is placed on correct laboratory procedures and techniques. They will be given opportunity to visit selected local industries where they could learn the practical application of analytical chemistry and to observe techniques and processes of quantitative analysis as well as the tools and instruments used.

From these visits, students need to come up with life cycle analysis diagram of chosen product detailing the various compounds, transformations, waste, and end products involved in its production and utilization.

Prerequisite: SCI202-Inorganic Chemistry

SCI205 **4 units**
PHYS2: THERMODYNAMICS (with LAB)

This course includes discussion of temperature and heat, thermal properties of matter, and laws of thermodynamics. The students would be able to differentiate between heat and temperature and apply these concepts to macroscopic world; relate heat with mechanical work and find ways on how heat can be used to perform a mechanical work; develop appreciation for the different laws of thermodynamics and their vast application in the society; and solve practical problems regarding heat and work and reason out soundly the values obtained in the solution.

For classroom teaching, students will search for songs, poems, or story scripts related to Thermodynamics which they could perform in the class and discuss how these could be integrated in the science lesson.

SCI206 **4 units**
BIO2: GENETICS (with LAB)

This course deals with the principles of heredity and variation; its application in plant and animal breeding; and social issues involved in its application. It also includes biometrical treatment of qualitative and quantitative characters of both

plants and animals. The laboratory component deals with exercises on chromosomal basis of inheritance, structure of genetic material, and Mendelian and Non-Mendelian inheritance. Each student will choose an emerging topic in Genetics or Biotechnology and come up with a driving question which would guide their research.

They will prepare a seminal paper and a poster and present their findings in the class.

Prerequisite: SCI201-Cell and Molecular Biology

SCI207 **5 units**
CHEM3: ORGANIC CHEMISTRY (with LAB)

This course is designed to introduce fundamental concepts of organic chemistry including hybridization, structure, nomenclature, and the application of electronic and structural effects in predicting properties and reactivity. The different classes of organic compounds are also covered. The laboratory course is designed to develop skills and techniques in the separation and purification of organic compounds. The laboratory course serves as the venue for the observation of structural effects on the physical and chemical properties of organic compounds. To assess the extent of students' learning, they will prepare a science fair where they exhibit the chemistry, application, risks to health and environment, and future development of a chosen organic compound.

Prerequisite: SCI202-Inorganic Chemistry

SCI208 **4 units**
PHYS3: ELECTRICITY AND MAGNETISM (with LAB)

This course is designed to discuss knowledge of basic relationship between electricity and magnetism. It includes topics on electrostatics and magnetism, electric and magnetic fields in matter, electrodynamics, and electromagnetic waves. It provides the students the mathematical relationship between current, voltage and resistance in an electric circuit. Students will gain skills in solving problems needing high mathematical analysis apart from the principles comprising this area of physics. Upon knowing the relationship between electricity and magnetism, students will be able to apply the concepts and principles to real life situations for life-long learning.

As a class exercise, they will be studying the general electrical set-up of the university in terms of supply, loading per building, uses of energy, power consumption, use of generators during power interruptions, fire safety and hazards, and ways to conserve electrical energy. A visit to companies generating renewable energy could also be facilitated to provide them a wider understanding of the issues related to energy generation, economy, and environment.

SCI209 **3 units**
EARTH SCIENCE

This course deals with the fundamental and historical geology, geologic processes such as rock formation, minerals and soil, weathering, erosion and mass movement, seismology, volcanism, and plate tectonics. Issues concerning the importance, exploration, utilization and conservation of mineral resources will also be dealt with.

For deeper appreciation of the local culture and resources, the class will map out using a mapping software the geological features that could be found in each town and city of the province and will prepare a brochure that describes the site, its geological and environmental importance, and how it could be integrated into the basic education science lesson.

SCI210 **3 units**
ENVIRONMENTAL SCIENCE 2

This course deals with the general concepts and principles pertaining to complex pattern of interaction between the physical environment and biological communities on earth. Emphasis is also given on the current environment issues and concerns as well as disaster risk management techniques.

This course recognizes that the field provides rich opportunities for students to be exposed to realities of the state of environment in the province. They will conduct field study in different ecosystems. These field studies engage students to come up with a creative environmental campaign that they will share with the Lasallian and local community as stewards of God's creation.

Prerequisite: ENSCI-Environmental Science

SCI211 **3 units**
METEOROLOGY

This course deals with the study of fundamental atmospheric process such as weather and climate. Emphasis will be on elements of weather, cloud formation processes, seasonal winds, ITCZ and tropical cyclones. The issues of climate change, mitigation and adaptation will be discussed.

To facilitate integration of their understanding of principles central to meteorology, they are expected to come up with education campaign materials that could be used to help intended audience understand the different weather phenomena and be prepared for adverse weather conditions and hydro-meteorological changes.

SCI212 **4 units**
BIO3: MICROBIOLOGY AND PARASITOLOGY (with LAB)

This course deals with the study of bacteria, viruses and helminths, their general characteristics, pathogenicity, source and mode of transmission. This course also covers the principles that underlie infection, disease control and prevention, as well as immunity. The impact of microorganisms on human health and environment, as well as their applications in industry are also given emphasis.

The laboratory course gives emphasis on activities that demonstrate major concepts of biology and parasitology and is designed to develop laboratory skills, including microscopy, aseptic technique, staining methods, culture methods, and identification of microorganisms.

To increase awareness of these pathogens, students will prepare a wanted poster for an assigned pathogen which will be exhibited or uploaded to a social media platform to reach wider and bigger audience.

SCI213 **4 units** **PHYS4: WAVES AND OPTICS (with LAB)**

The course discusses the fundamental concepts of mechanical and electromagnetic waves. It describes the production and propagation of waves, its characteristics, types and properties. It also deals with simple harmonic motion. This course also gives emphasis on the nature and duality of light particularly on physical and geometric optics. It also allows the students to gain insights on the importance of waves on daily activities and to apply the concepts and principles in problem solving.

Students will collaborate with each other to come up with a science show in a selected school that will showcase magic tricks and simple experiments which could be used as motivational activity or enrichment activity in teaching waves and optics in the K to 12 curriculum.

Prerequisite: SCI208-Electricity and Magnetism

SCI214 **3 units** **PHYS5: MODERN PHYSICS**

This course covers topics including relativity, photoelectric effect, Bohr model, wave-particle duality, and quantum mechanics.

Students will be challenged to develop conceptual and physical models for abstract ideas covered in this course such as time travel, Big Bang Theory, Einsteinian idea of space, quantum mechanics, relativity, among others, to facilitate effective teaching of these concepts.

Prerequisite: SCI208-Electricity and Magnetism

SCI215 **4 units** **BIO4: ANATOMY AND PHYSIOLOGY (with LAB)**

This course deals with the study of fundamental structures of the human body and their corresponding functions. It emphasizes the integration of the organ systems in relation to normal health and provides information on associated disorders. The laboratory course deals with experiments involving organ systems of the human body. It is also designed to develop the skills in the macroscopic and microscopic examinations of the tissues and organs of the human body.

To develop further their research skills so they will be more adept in the use of scientific literature, students will conduct a literature review of recent

studies published in scientific journals about recent developments in the field of medicine related to the assigned organ.

SCI216 **3 units** **ASTRONOMY**

This course deals with the various motions observed in the heavens and the fundamental physical laws that govern them. This course also includes a discussion of the theories behind the formation of the solar system and other astronomical bodies.

Students will be engaged in various classroom and field activities that will develop their skills and interest in teaching this course. A compilation of individual and group learning outputs will be submitted at the end of the course. As a final requirement, they will facilitate a sky-watching activity with students in a selected school.

SCI217 **3 units** **THE TEACHING OF SCIENCE**

This course deals with the goals, materials, content, assessment, management and methods of teaching science at the secondary level and it provides opportunities for class observation and demonstration teaching.

At the end of the course, students are expected to present learning plans following different formats, conduct short teaching demonstration showcasing different approaches, and prepare localized and contextualized inquiry-based learning materials.

Prerequisite: All content courses

SCI218 **3 units** **RESEARCH IN TEACHING SCIENCE**

This is an action research in the content or pedagogy of science in any of the four areas: Biology, Chemistry, Physics and Earth Science.

SCI219 **3 units** **CHEM4: BIOCHEMISTRY**

This course covers the fundamental aspects of biochemistry and the structure and dynamics of important cellular components. The structure, properties, functions and metabolism of carbohydrates, proteins, lipids and other important biochemical compounds are also discussed.

It allows the students to appreciate the importance of biomolecules involved in building up of different organic polymers to maintain homeostasis in an organism's system. Students will prepare and present a simple lesson for an assigned biomolecule.

Prerequisite: SCI207-Organic Chemistry

SCI220 **3 units** **TECHNOLOGY FOR TEACHING AND LEARNING II (SCIENCE)**

This course focuses on the application, design, production, utilization, and evaluation of Information and Communications Technology (ICT) materials for teaching and learning in Science Education Programs. The major requirement for

this course is an ICT-integrated and Project-based Learning plan aligned to the K to 12 curriculum.

All learning activities and course requirements will revolve around the student-teacher developed learning plan with a concrete ICT material.

Prerequisite: EDCN104-Technology for Teaching and Learning 1