STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

DEPARTMENT OF BIOTECHNOLOGY

Programme Learning Outcomes/Intended Programme Learning Outcomes

Graduates of a Master's Degree of Stella Maris College will have a comprehensive knowledge of their disciplines, with indepth knowledge of the underlying principles and concepts in one or more disciplines as a basis for independent lifelong learning.

At the end of a postgraduate programme students will be able to

· Demonstrate mastery in the discipline

· Demonstrate deep understanding of the broad principles of science and technology and apply them in varied contexts

· Demonstrate knowledge, understanding and professionalism required for the discipline

· Demonstrate capability to locate, evaluate, manage, and use information/data and research to develop and guide their own knowledge, learning, and practice

· Demonstrate the ability to organise a presentation in a coherent fashion

· Demonstrate the literacy and numeracy skills necessary to understand and interpret information/data and communicate according to the context

· Draw on multiple, relevant/interrelated fields of study to understand, analyse and solve problems

· Exhibit principled decision making and reasoning to identify creative solutions to ethical problems

· Practice/act in ways that show a commitment to social justice and the processes of peace/conflict resolution

· Demonstrate the skills to appropriately interact with people from a range of cultural, linguistic, and religious backgrounds

· Demonstrate an understanding of local, regional, national, and global issues

· Identify themselves as agents of change

· Demonstrate the ability to solve an issue

· Show self-awareness and emotional maturity

· Demonstrate career and leadership readiness

· Exhibit the ability to work in teams

· Demonstrate sensitivity and readiness to share their knowledge and capabilities with the marginalised and oppressed in their communities

PROGRAMME DESCRIPTION

The Master's programme in Biotechnology combines biology with technology which encompasses various branches of applied sciences. The programme lays emphasis on the advanced area of biotechnology involving controlled and deliberate manipulation of biological systems for the development of a new technology for industrial products. It is an interdisciplinary science, it focusing on subjects such as molecular biology, microbiology, stem cell and tissue engineering, marine biotechnology and environmental biotechnology. The programme will acquaint the student on basic and applied sciences, research skills and interpretation of the biological data on an experimental approach.

PROGRAMME SPECIFIC LEARNING OUTCOMES

On successful completion of the programme, the students will be able to

· Comprehend the basic principles of biotechnology

· Explain the concept and application of current applications of biotechnology and advances in the different areas including microbial, animal, plant, environmental, food, pharmaceutical and medical sciences

· Propose, design and deliver an experiment to address a research hypothesis

· Analyze data and interpret the results

· Provide technological solutions in the fields of modern biotechnological applications

·Develop useful intellectual bio-based products to the society

· Identify and debate the ethical, legal, professional and social issues in the field of biotechnology

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI 600 086

M.Sc. DEGREE : BIOTECHNOLOGY

COURSES OF STUDY

(Effective from the academic year 2019-2020)

CHOICE BASED CREDIT SYSTEM

C-Credit, **L**-Lecture Hours, **T**-Tutorial Hours, **P**- Practical Hours, **Ex**-Exam Hours,
CA- Continous Assessment Marks, **ES**-End Semester Marks, **M**-Maximum Marks

Subject Code	Title of Course	C	L	T	P	Ex	CA	ES	M
	SEMESTER-I								
19BY/PC/BC14	Biochemistry	4	4	1	0	3	50	50	100
19BY/PC/MI14	Microbiology	4	4	1	0	3	50	50	100
19BY/PC/MR14	Molecular Biology and Recombinant DNA Technology	4	4	1	0	3	50	50	100
19BY/PC/P112	Biochemistry and Microbiology Practical	2	0	0	3	6	50	50	100
19BY/PC/P213	Molecular Biology and Recombinant DNA Technology Practical	3	0	0	5	6	50	50	100
	Department Elective I								
	SAP/SL	2	2	0	0	-	50	-	100
	SEMESTER-II								
19BY/PC/AP25	Animal and Plant Biotechnology	5	5	1	0	3	50	50	100
19BY/PC/RM24	Research Methodology	4	4	1	0	3	50	50	100
19BY/PC/P324	Animal and Plant Biotechnology Practical	4	0	0	6	6	50	50	100
CD/ET	Value Education	2	2	0	0	0	50	0	100
19BY/PK/SS22	Soft Skills	2	2	0	0	0	50	0	100
	Department Elective II								
	Common Elective I								
	SEMESTER-III								
19BY/PC/IM34	Immunotechnology	4	4	1	0	3	50	50	100
19BY/PC/BF34	Bioprocess and Fermentation Technology	4	4	1	0	3	50	50	100
19BY/PC/ET34	Environmental Biotechnology	4	4	1	0	3	50	50	100
19BY/PC/P432	Immunotechnology Practical	2	0	0	3	6	50	50	100
19BY/PC/P533	Bioprocess and Environmental Biotechnology Practical	3	0	0	5	6	50	50	100
CD/ET	Value Education	2	2	0	0	0	50	0	100
19BY/PN/SI32	Summer Internship	2	2	0	0	0	50	0	100
	Common Elective II								
	SEMESTER-IV								
19BY/PC/ST45	Applications of Stem Cell and Tissue Engineering	5	5	1	0	3	50	50	100
19BY/PC/BN45	Bio-nanotechnology	5	4	1	0	3	50	50	100
19BY/PC/DI47	Dissertation	7	0	0	9	0	50	50	100
	Department Elective III								

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Subject Code	Title of Course	C	L	T	P	Ex	CA	ES	M
Postgraduate Elective Courses Offered to Parent Department									
19BY/PE/FB15	Food Biotechnology	5	5	0	0	0	50	50	100
19BY/PE/BI15	Bioinstrumentation	5	5	0	0	0	50	50	100
19BY/PE/PB15	Pharmaceutical Biotechnology	5	5	0	0	0	50	50	100
19BY/PE/IB15	IPR, Biosafety, Bioethics and Entrepreneurship	5	5	0	0	0	50	50	100
19BY/PE/EZ15	Enzyme Technology	5	5	0	0	0	50	50	100
19BY/PE/VR15	Virology	5	5	0	0	0	50	50	100
19BY/PE/MT15	Marine Biotechnology	5	5	0	0	0	50	50	100
Postgraduate Elective Courses Offered to Other Departments									
19BY/PE/AB23	Applications of Biotechnology	3	3	0	0	3	50	50	100
19BY/PE/HG23	Human Genetics	3	3	0	0	3	50	50	100
19BY/PE/HD23	Human Diseases and Management	3	3	0	0	3	50	50	100
Independent Elective Courses									
19BY/PI/MO24	Molecular Oncology	4	0	0	0	0	0	100	100

BIOCHEMISTRY
CODE:19BY/PC/BC14
CREDITS:4
L T P:4 1 0
TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

· To gain knowledge on the core principles and topics of Biochemistry

· To have a biochemical insight of various components of cells and their functions

· To enumerate the biochemical functions of water, buffer, enzymes and hormones and its role in metabolism of living matters

· To demonstrate an understanding of the principles, and practical experience of, a wide range of biochemical techniques

· To understand the scope of biochemistry for further education, research and employment

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· demonstrate structured knowledge of fundamental biochemical principles, such as the structure/function of biomolecules, metabolic pathways, and the regulation of biological/biochemical processes

· explain biological mechanisms and underlying relationship in view of biochemical reactions

· design effective biochemical experiments and be able to apply the scientific method to the processes of experimentation

· critically analyze data, trouble-shoot and effectively communicate scientific reasoning and data analysis in both written and oral forums

· practice the ethics surrounding biochemical scientific research

MICROBIOLOGY CODE: 19BY/PC/MI14
CREDITS: 4
L T P: 4 1 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

· To understand growth and morphology of microbes

· To create an awareness on applied aspects of microbiology

· To provide insight on different aseptic culture techniques for practical knowledge

· To establish an overview of the recent advances in the field of microbiology

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· establish knowledge on morphology of different microbes

· demonstrate the understanding on Microbial Diseases, their growth and control

· comprehend the current scenario of microbiology in industrial applications

· explicit learning on microscopy and culturing methods

· appreciate various applications of microbiology in various fields

MOLECULAR BIOLOGY AND RECOMBINANT DNA TECHNOLOGY
CODE: 19BY/PC/MR14
CREDITS: 4
L T P: 4 1 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

· To provide knowledge in the areas of molecular biology, including genomics, transcriptional and post-transcriptional regulatory networks

· To gain knowledge of medicinal processes through the investigation of the underlying molecular mechanisms

· To prepare for further education and/or employment in teaching, basic research, or the health professions

· To provide a scientific and technical understanding on plasmids and vectors and its applications in recombinant DNA technology

· To conceive knowledge on gene cloning and molecular sequencing

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· exhibit a knowledge base in molecular biology and able to discuss biological process significantly on the aspects of molecular science

· demonstrate the understanding of common and advanced laboratory practices in molecular biology

· formulate and execute independently/collaboratively research projects using the techniques in molecular biology with the appropriate analysis of the results obtained

· perceived a detailed description of different types of Vectors and their cloning techniques

· scientific learning on different application of recombinant DNA Technology

ANIMAL AND PLANT BIOTECHNOLOGY
CODE: 19BY/PC/AP24
CREDITS: 4
L T P: 4 2 0
TOTAL TEACHING HOURS: 78

OBJECTIVES OF THE COURSE

· To understand the principles of animal cell culture and its application

· To understand the basics of transgenic animals, techniques, associated protocols and their applications · To provide an insight into the techniques and applications of plant cell culture

· To understand concepts of transgenic plant technology

· To evaluate the risks and benefits of plant biotechnology

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· explain how the principles of biotechnology are being applied to address animal health issues

· describe the basics of maintenance of mammalian cell and generation of cell line using proper sterile techniques and optimum conditions for growth

· demonstrate the understanding of plant tissue culture and genetic engineering techniques and their identification using molecular marker assisted selections

· comprehensive training in the plant biotechnology and its application for increasing agricultural production, environment improvement, nutrition and health

· describe the current issues in transgenic plants

· execute research projects using the techniques in plant biotechnology with the appropriate analysis of the results obtained

RESEARCH METHODOLOGY
CODE: 19BY/PC/RM24
CREDITS: 4
L T P: 4 1 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

· To develop a research orientation among the students and to acquaint them with fundamentals of research methods

· To identify the overall process of designing a research study

· To develop the technical art of writing research report and presentations

· To provide an understanding for quantitative reasoning using logical and statistical methods

· To acquire knowledge on applications of statistics in research

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· describe the concepts and research design

· demonstrate the ability to choose methods appropriate to research aims and objectives

· develop advanced critical thinking and skills in qualitative and quantitative data analysis

· demonstrate enhanced writing skills in preparing research grant proposals, scientific research/report and manuscript

· independently set hypothesis, analyze and interpret statistically

IMMUNOTECHNOLOGY
CODE:19BY/PC/IM34
CREDITS:4
L T P:4 1 0
TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

· To provide an understanding of the immune system and its components

· To gain knowledge on classical and clinical immunology

· To familiarize diagnostic immunology and immunotherapy

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· conceptualize how the innate and adaptive immune responses coordinate to fight invading pathogens · describe the immune system in maintaining health and contributing to disease

· determine what immunomodulatory strategies can be used to enhance/ suppress immune responses such as might be required in hypersensitivity reactions, transplantations or autoimmune diseases

· apply the roles of immunology in protection against disease and autoimmune disorders to choices in their daily live

· identify diagnostic tools available in the field of Medical Science to combat diseases

BIOPROCESS AND FERMENTATION TECHNOLOGY
CODE:19BY/PC/BF34
CREDITS:4
L T P:4 1 0
TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

· To provide the basics of bioreactors and its applications

· To develop bioengineering skills for the production of biochemical product using integrated biochemical processes

· To create an awareness on important industrial bio-products and the applications of enzymes in various fields

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· comprehensive understanding of design and types of bioreactors

· apprehend the concepts of downstream processing to retrieve the product

· demonstrate a wide range of scientific thinking fermentation technology and to produce economically important products · perceive new methods and applications of microorganism and its product

ENVIRONMENTAL BIOTECHNOLOGY
CODE:19BY/PC/ET34
CREDITS:4
L T P:4 1 0
TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

· To gain understanding of environment, about the ecosystem, bioremediation and its crisis

· To create an awareness of current technology employed in environmental sustainability

· To apprehend waste management technologies for different industries

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· conceive the fundamental issues of the environment and ecology

· comprehend on industrial pollution management and applications of recombinant DNA technology in environmental management

· explain different treatment methods for wastewater generated from municipal and industrial waste

SUMMER INTERNSHIP
CODE:19BY/PN/SI32
CREDITS:2

OBJECTIVES OF THE COURSE

· To enable students to gain experiential learning in the field in Biotechnology

· The acquire hands – on training in Biotechnological techniques The Summer Internship program is for a minimum period of three weeks. The students are expected to have regular attendance in their respective Institute and submit an assignment to the Department reporting the experiments they have observed/conducted. The students are expected to give a seminar presentation in the third semester of the work they have observed/conducted.

APPLICATIONS OF STEM CELL AND TISSUE ENGINEERING
CODE: 19BY/PC/ST44
CREDITS:4
L T P:4 2 0
TOTAL TEACHING HOURS: 78

OBJECTIVES OF THE COURSE

· To learn the concept of Stem cells & and their application in Engineering organs for replacement and Transplantation

· To offers updated fundamental knowledge, technological advancements and potential applications of stem cells and tissue engineering

· To provide an overview of fundamental concepts in Tissue Engineering

· To review the current scenario of tissue engineering applications in bioartificial organs development and transplantation

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· comprehend the basics of Stem cell biology, various sources of stem cells and their applications

· demonstrate how stem cells can be used to treat various disorders such as the neurodegenerative disorders, cardiovascular disorders and diabetes

· elucidate the fundamentals of Tissue Engineering including cells and scaffolds, various techniques associated and limitations

· apply Tissue Engineering principles to the solution of medical problems requiring the regeneration of tissues and the method for the fabrication of tissue engineered products

BIO-NANOTECHNOLOGY
CODE :19BY/PC/BN44
CREDITS:4
L T P:4 1 0
TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

· To introduce the fundamentals of multidisciplinary nature of Bionanotechnology

· To have a better understanding of key design factors at the synthesis/fabrication methods of nanostructures

· To discuss on the possibility of current and future applications of nanostructured materials

· To acquire a discipline-based knowledge to create an impact in commercial products and technologies

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· review an overview of the state-of-the-art nanosynthesing processes and application of nano materials · critically discuss various characterization methods of bionanotechnology

· elucidate emerging needs of bionanotechnology in different fields of life sciences

· assess the research directions in nanoscience and nanotechnology

· identify interdisciplinary research approaches in the field of bionanotechnologyprojects

· evaluate regulatory, ethical and economical problems of nanoscale domain

DISSERTATION
CODE:19BY/PC/DS49
CREDITS:9

FOOD BIOTECHNOLOGY
CODE: 19BY/PE/FB15
CREDITS : 5
L T P : 5 0 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

· To elaborate the biotechnological applications related to food

· To understand the techniques involved in the food processing and food preservation

· To comprehensive understanding of food additives, biotechnological food diagnosis and regulations

COURSE LEARNING OUTCOME

On successful completion of the course, students will be able to

· discuss the biotechnological aspects of food industries

· demonstrate the knowledge of the fundamentals of food processing

· explain about the constituents, food additives and enzymes in food industry

· discuss about the microorganisms associated with food and food borne toxins`

· to gain employment in the food industry and food product development

BIOINSTRUMENTATION
CODE:19BY/PE/BI15
CREDITS:5 L T P:5 0 0
TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

· To build the strong foundation in the field of Instrumentation

· To introduce components of instruments for biological applications

· To familiarize physical principles governing the design and operation of instrumentation systems

· To discuss on ethical and regulatory issues related to the analytical techniques and instruments used in life sciences

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· explore an overview of instrumentation systems used in biotechnological research.

· describe the classification, construction, working principle and application of various biochemical and molecular instruments

· identify the basic concept of qualitative and quantitative analysis of a given sample.

· discuss on the principle and working of various Radiation detectors

· identify and use instruments required for specialized courses and project work

PHARMACEUTICAL BIOTECHNOLOGY
CODE:19BY/PE/PB15
CREDITS:5
L T P:5 0 0
TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

· To provide brief knowledge on parameters to be considered for ideal drug

· To familiarize the preparation, stability and formulation of drugs

· To highlight the drug action and various drug delivery systems

· To explain production of biotechnological products in pharmaceutical market

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· understand the drug discovery process and its requirements

· demonstrate different pharmaceutical parameters of current biotechnology products

· discuss novel formulation methods for better delivery of biotechnology derived drugs

· pursue career in pharmaceutical research and industries

IPR, BIOSAFETY, BIOETHICS AND ENTREPRENEURSHIP
CODE:19BY/PE/IB15
CREDITS:5
L T P:5 0 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

· To create consciousness on intellectual property rights and their implications in bio product development · To acquire knowledge on drafting and applying a patent

· To learn biosafety, risk assessment and regulations of products derived from biotechnology

·To familiar with ethical issues in biological research

· To know the importance of innovation and Bio-entrepreneurship

· To explain marketing and management in entrepreneurial activity

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· interpret IPR at an early stage of their education and to take ownership of creative innovations

· familiarize with India's IPR policy and on the implications in national/international trade

· aware of their rights for the protection of their invention done in their project work

· appreciate the ethical use of knowledge for the betterment of society and economic development

· explain entrepreneurship viz., identifying an opportunity, gathering funding and launching a business

· work as a team and have the opportunity to develop their new venture and management skills

ENZYME TECHNOLOGY
CODE: 19BY/PE/EZ15
CREDITS: 5
L T P: 5 0 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

· To acquire fundamental knowledge of enzymes and its implications on industrial processes

· To create an awareness on important industrial bio-products and the applications of enzymes in various fields

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· to describe structure, functions and the mechanisms of action of enzymes

· to understand kinetics of enzyme catalyzed reactions and enzyme inhibitory and regulatory process

· to perform immobilization of enzymes

· to have an exposure of wide applications of enzymes and their future potential

VIROLOGY
CODE:19BY/PE/VR15
CREDITS:5
L T P:5 0 0
TOTAL TEACHING HOURS:65

OBJECTIVES OF THE COURSE

· To provide an understanding on viruses and its molecular biology concepts

· To understand the viral life cycle and pathogenesis

· To give an insight on human viral diseases

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· describe the interactions between viruses and the host immune system

· understand how viruses are organized, replicate and cause disease

· define the process of virus latency

· describe the molecular pattern of the virus

· familiarize with current issues in the field of virology

· coherently report outcomes of virological research

MARINE BIOTECHNOLOGY
CODE: 19BY/PE/MT15
CREDITS: 5
L T P: 5 0 0
TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

· To understand the essential facts and concepts related to marine biotechnology

· To get acquainted with the marine flora and fauna, their basic functions and role in the ecosystem

· To acquire the ability to determine marine pollutants and their interaction

· To gain insights into marine bio products

· To apply biotechnology methodologies to the marine environment betterment

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· explain the structure, function and importance of marine ecosystems

· describe the diversity of the marine environment

· explore the ecological impacts of pollution on marine water quality, habitats, biodiversity and food webs

· explain the accumulation of toxins in food chains and explore its impact on human food sources

· comprehend the values of marine ecosystem in relation to bio products and its application in biotechnology

APPLICATIONS OF BIOTECHNOLOGY
CODE:19BY/PE/AB23
CREDITS:3
L T P:3 0 0
TOTAL TEACHING HOURS:39

OBJECTIVES OF THE COURSE

· To understand the basic of biotechnology

· To provide an insight on the trends of bio-techniques

· To familiarize the applications of Biotechnology in everyday life

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· understand the fundamentals of biotechnology

· discuss the use of by products

· demonstrate a knowledge of transgenic plants and animals

· explain the molecular diagnosis and treatment of diseases

HUMAN GENETICS
CODE:19BY/PE/HG23
CREDITS: 3
L T P: 3 0 0
TOTAL TEACHING HOURS:39

OBJECTIVES OF THE COURSE

· To get the insight on the principles of inheritance as formulated by Mendel

· To describe normal chromosome number, structure, and behavior in human cells

· To understand genome sequencing project

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· explore the fundamentals of human genetics

· identify family history, construct and interpret a pedigree

· brief chromosomal basis of inheritance and its alterations

·recognise the relationship between phenotype and genotype

· approach genetic counselor

· explain the molecular and biochemical basis, diagnosis and treatment of genetic disease

HUMAN DISEASES AND MANAGEMENT
CODE:19BY/PE/HD23
CREDITS:3
L T P:3 0 0
TOTAL TEACHING HOURS:39
OBJECTIVES OF THE COURSE

· To understand of pathogenic spectrum of human

· To gain knowledge on the underlying causes of human diseases

· To familiarize the disease prevention and diagnosis

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· demonstrate a basic understanding of the concepts and elements of disease

· elucidate the mechanisms, diagnosis and treatment of diseases

· describe the effects of drugs abuse on the human body

· discuss a balanced diet and the value of exercise to health

· evaluate scientific articles on health-related topics

MOLECULAR ONCOLOGY
CODE: 19BY/PI/MO24
CREDITS: 4
OBJECTIVES OF THE COURSE

· To understand basic aspects of cancer biology

·To familiar with genetic changes in tumors

· To learn the cell cycle, angiogenesis and apoptosis

·To familiar with basic facets of carcinogenesis and methods to study the process

· To understand how immunotherapy is used to treat human illness

COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

· discuss the major aspects of a tumor

· describe and discuss molecular characteristics of a tumor cell

· use methods to study tumor genesis and tumor progression

· understand the basic principles and applications of cell culture to study cancer

· read scientific articles and gain understanding of the scientific contents