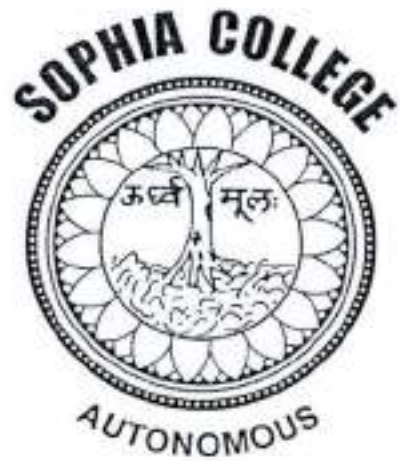


SOPHIA COLLEGE (AUTONOMOUS)

Affiliated to the University of Mumbai

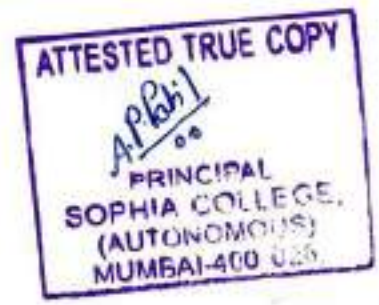
Programme: **SCIENCE**

Programee code: SCHE

Syllabus for the Academic Year 2023-2024

based on the National Education Policy 2020

(Choice Based Credit System with effect from 2023-2024)



SCHE511RM	1	SCIENTIFIC INVESTIGATION	4
	2	DATA REPRESENTATION AND INTERPRETATION	
	3	LABORATORY SAFETY & ETHICAL HANDLING OF CHEMICALS	
	4	LOGICAL MATHEMATICAL REASONING & COMPUTATIONAL TOOLS	

Programee Outline: M.Sc Part I (SEMESTER II)

Course code	Unit no	Name of the unit	Credits
SCHE523MJ		PHYSICAL AND INORGANIC CHEMISTRY	4
	1	QUANTUM CHEMISTRY	
	2	ELECTROCHEMISTRY	
	3	INORGANIC REACTION MECHANISM	
	4	INORGANIC REACTION MECHANISM	
SCHE523PMJ		PRACTICAL	2
SCHE524MJ		ORGANIC AND ANALYTICAL CHEMISTRY	4
	1	1.1REACTIONS AND REARRANGEMENTS 1.2MOLECULAR ORBITAL THEORY	
	2	SPECTROSCOPY	
	3	THERMAL METHODS	
	4	ELECTROANALYTICAL METHODS	
SCHE524PMJ		PRACTICAL	2
SCHE522E		ADVANCED INSTRUMENTAL TECHNIQUE	2
	1	SURFACE ANALYTICAL TECHNIQUES	
	2	CHROMATOGRAPHY	
SCHE22EP		PRACTICAL	2
		ON JOB TRAINING (OJT)	4

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spectrophotometrically.

6.To determine the amount of calcium in milk powder by flame photometry.

7.Determination of K^+ in a given sample by standard addition method (flame photometer)

8. Spectral interpretation of IR, mass and XRD spectrum

REFERENCES

1. Quantitative Inorganic Analysis including Elementary Instrumental Analysis by A. I. Vogels, 3rd Ed. ELBS (1964)
2. Standard Instrumental Methods of Chemical Analysis, F. J. Welcher

NAME OF THE COURSE	Research Methodology	
CLASS	M.Sc Part I	
COURSE CODE	SCHE1IRM	
NUMBER OF CREDITS	4	
NUMBER OF LECTURES PER WEEK	4	
TOTAL NUMBER OF LECTURES PER SEMESTER	60	
EVALUATION METHOD	CONTINUOUS ASSESSMENT	SUMMATIVE ASSESSMENT
TOTAL MARKS PASSING MARKS	50 20	----

Learning objectives

CO1	
CO2	
CO3	

Learning Outcomes:

CLO1	
CLO2	
CLO3	

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UNIT I	SCIENTIFIC INVESTIGATION	15L

1.1	Measurement and errors: Introduction to measurement; errors and types of errors (gross, systematic and random) with examples and case studies; uncertainty in measurement- accuracy, precision (definition and their estimation), significant figures.	
1.2	Describing Data: Analytical Data, population and sample; measures of central tendencies-mean, median; measures of dispersion or variability- standard deviation, variance, RSD; degrees of freedom and standard deviation of mean; confidence intervals and confidence limits; repeatability and reproducibility of measurement.	
1.3	ICH guidelines for analytical procedures- Introduction to analytical procedure development; Validation of analytical procedures: Specificity, linearity, range, accuracy, precision, detection and quantitation limits, robustness and system suitability testing	
1.4	Scientific Literature and communication: Print, digital, information technology and library resources; scientific reporting of practical and project work, literature review, oral and poster presentations, manuscript- title, abstract and body IMRaD format, acknowledgements and references; scientific misconduct- falsification, fabrication and plagiarism, authorship and ethics in scientific research	
UNIT II	**DATA REPRESENTATION AND INTERPRETATION**	**15L**
2.1	Representation of data: Figures and Tables; Graphs, pictographs, scatter plots; file formats resolution and legends.	
2.2	Testing of hypotheses: Importance of hypotheses testing, levels of confidence and significance, type I & II errors, determining significant systematic errors- Z, t test; normal distribution; testing of means- student's t test; testing Variances- F test, ANOVA.	
2.3	Advanced statistical techniques & calibration: Correlation and regression, curve fitting, linear calibration model, analysis of residuals, interpolation through linear least square fitting, r and r squared.	
2.4	Polynomial fitting and Multivariate analysis: general polynomial fitting, linearizing transformations, exponential function fit, basic aspects of multiple linear regression analysis, discriminant analysis, multivariate analysis of variance, factor and cluster analysis.	
UNIT III	**LABORATORY SAFETY & ETHICAL HANDLING OF CHEMICALS**	**15L**
3.1	Principles, ethics and safety practices: Hazards, risk and safety; RAMP principles of safety; safety ethics and rules	
3.2	Sustainable and green practices in the laboratory: green chemistry principles and practices	
3.3	Safety regulations: employers expectations of safety skills; laws and regulations pertaining to safety- 29CFR, Indian CMSR (Chemical Management [illegible] Rules)	

3.4	Understanding laboratory hazards: Signs, symbols and safety; Hazard information (MSDS, SDS); Globally Harmonized System of Classification and Labelling of Chemicals (GHS); physical hazards in the laboratory and their minimization (case studies)	
UNIT IV	**LOGICAL MATHEMATICAL REASONING & COMPUTATIONAL TOOLS**	**15L**
4.1	Types of reasoning; Number series, Letter series, Codes and Relationships; Mathematical Aptitude (Fraction, Time & Distance, Ratio, Proportion and Percentage, Profit and Loss, Interest and Discounting, Averages etc.)	
4.2	Microsoft excel and origin for Chemists: Determination of central tendencies and dispersion- mean, standard deviation, RSD; confidence limits; plots using excel & origin, correlation and regression, standard errors, error bars	
4.3	Use of excel in analytical chemistry: titration curves and determination of equivalence points, derivative plots; simulation of chemical kinetics	
4.4	Cheminformatics tools: Chemdraw, Chemsketch, Mestrenova, NMRDB, openbabel,Reference manager (Mendeley)	

REFERENCES

Unit 1

1. Hibbert, D. B. & Gooding, J. J. (2006) Data Analysis for Chemistry Oxford University Press
2. Dharmapalan, B. (2012). Scientific Research Methodology. Alpha Science International Ltd.
3. International Council of Harmonisation: https://www.ich.org/page/quality-guidelines

Unit 2

1. Hibbert, D. B. & Gooding, J. J. (2006) Data Analysis for Chemistry Oxford University Press
2. Chandra S. & Sharma M. K. (2013). Research methodology. Alpha Science International.
3. Kothari C. R. (2004). Research methodology : methods & techniques (2nd rev.). New Age International (P).

Unit 3.

1. Hill R. H. & Finster D. C. (2016). Laboratory safety for chemistry students (Second). John Wiley & Sons.
2. Indian Chemical Regulation https://indianchemicalregulation.com/
3. American Chemical Society https://institute.acs.org/courses.html

Unit 4

1. K.V.S. Madaan (2020). Teaching and Research Aptitude, Pearson India Education Services Pvt. Ltd

SOPHIA COLLEGE, (AUTONOMOUS)

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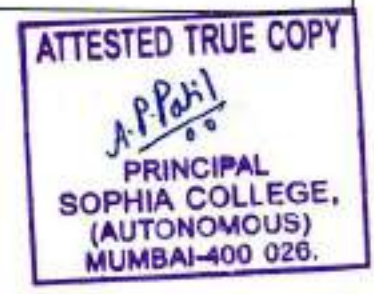
Programme: Information Technology

Programme Code: SBTTEC

T.Y.B.Sc.IT

(Choice Based Credit System with effect from the year 2022-23)



Programme Outline: TYBscIT (SEMESTER V)

Semester – 5			
Course Code	**Unit No**	**Course Title**	**Credits**
SBTTEC501		**SOFTWARE PROJECT MANAGEMENT**	**2**
	1	Introduction, Software Requirements, Software Development Process Models	
	2	Introduction to Software Project Management, Project Evaluation and Programme Management:	
	3	Activity Planning, Resource Allocation, Risk Management	
	4	Verification and Validation, Software Measurement, Software Cost Estimation	
	5	Monitoring and Control, Quality Management, Project Closeout:	
SBTTEC502		**INTERNET OF THINGS**	**2**
	1	The Internet of Things: An Overview, Design Principles for Connected Devices, Internet Principles	
	2	Thinking About Prototyping, Prototyping Embedded Devices:	
	3	Prototyping the Physical Design, Prototyping Online Components	
	4	Techniques for Writing Embedded Code, Business Models	
	5	Moving to Manufacture, Ethics	
SBTTEC503		**ADVANCED WEB PROGRAMMING**	**2**
	1	Introducing .NET, The C# Language ,Types, Objects, and Namespaces	
	2	Web Form Fundamentals, Form Controls ,	
	3	Error Handling, Logging, and Tracing, State Management, Styles, Themes, and Master Pages ,	
	4	ADO.NET Fundamentals, Data Binding	
	5	XML, Security Fundamentals, ASP.NET AJAX	
SBTTEC504		**LINUX SYSTEM ADMINISTRATION**	**2**
	1	Introduction to Red Hat Enterprise Linux, Command Line, System Administration Tasks, Managing Software	
	2	Configuring and Managing Storage, Connecting to the Network, Working with Users, Groups, and Permissions	
	3	Securing Server with iptables, Setting Up	

COURSE OBJECTIVE

CO 1. Student will be able to describe the basic equation of IOT and define its relation with ubiquitous computing

CO 2. Student will be able to recognize the characteristics of different board used in prototyping.

CO 3. Student will be able to describe and differentiate between the various methods used for physical design prototyping and software prototyping

CO 4. The student will be able to identify the purpose of business model canvas and would be able to propose one.

CO 5. Discover the importance of security while prototyping. And will be able to identify various funding methods for scaling up the production of prototype.

COURSE LEARNING OUTCOMES

CLO 1. State examples IOT device show each component of equation in the stated example-comprehension application

CLO 2.Differentiate between arduino rasberrypi and beaglebone black

CLO 3.Explain the methods of software prototyping with its advantages

CLO 4.Construct a business model canvas taking a suitable example

CLO 5.Explain the factors on deciding which funding methodology to use for mass production

Unit	INTERNET OF THINGS (15 LECTURES)
1	
1.1	**The Internet of Things: An Overview** : The Flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?
1.2	**Design Principles for Connected Devices:** Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens On The Internet, Graceful Degradation, Affordances.
1.3	**Internet Principles:** Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.
2	
2.1	**Thinking About Prototyping:** Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, Climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market

2.2	Projects, Tapping into the Community. **Prototyping Embedded Devices:** Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, Developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness
3	
3.1	**Prototyping the Physical Design:** Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling.
3.2	**Prototyping Online Components:** Getting Started with an API, Mashing Up APIs, Scraping, Legalities, Writing a New API, Clockodillo, Security, Implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained Application Protocol.
4	
4.1	**Techniques for Writing Embedded Code:** Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging,
4.2	**Business Models:** A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, Be a Key Resource, Provide Infrastructure: Sensor Networks, Take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.
5	
5.1	**Moving to Manufacture:** What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community.
5.2	**Ethics:** Characterizing the Internet of Things, Privacy, Control, Disrupting Control, Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition.

Sr. No.	Title	Author/s	Publisher	Edition	Year

SOPHIA COLLEGE
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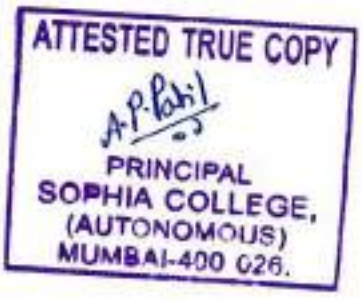
Affiliated to the University of Mumbai
Syllabi for F.Y., S.Y, T.Y. Semester I-VI
Program: B. A.
Course: **Sociology**

(Choice Based Credit System with effect from the year 2018-19)



List of Course Titles and Course Codes

Department: SOCIOLOGY

Class	Sem	Paper No.	Course Title	Course Credits	Course Code
FYBA	I	I	Foundations of Sociology	03	SBA.SOC.101
FYBA	II	I	Fundamentals of Sociology	03	SBA.SOC.201
SYBA	III	II	Indian Society: Structure and Change	03	SBA.SOC.301
SYBA	III	III	Contemporary Issues in Indian society	03	SBA.SOC.302
SYBA	IV	II	Sociology of Development	03	SBA.SOC.401
SYBA	IV	III	Emerging Fields in Sociology	03	SBA.SOC.402
TYBA	V	IV	Social Theory	04	SBA.SOC.501
TYBA	V	V(A)	Sociology of Work	04	SBA.SOC.502A
		V(B)	Sociology of Agrarian society	04	SBA.SOC.502B
TYBA	V	VI	Sociology of Gender	3.5	SBA.SOC.503
TYBA	V	VII	Sociology of Human Resource Development	04	SBA.SOC.504
TYBA	V	VIII	State Civil society and Social Movements	04	SBA.SOC.505
TYBA	V	IX	Quantitative Social Research	3.5	SBA.SOC.506
TYBA	VI	IV	Theoretical Anthropology	04	SBA.SOC.601
TYBA	VI	V(A)	Sociology of Informal sector	04	SBA.SOC.602A
		V(B)	Development and changes in Agrarian society	04	SBA.SOC.602B
TYBA	VI	VI	Gender and Society in India: Emerging Issues	3.5	SBA.SOC.603
TYBA	VI	VII	Sociology of Organizations	04	SBA.SOC.604
TYBA	VI	VIII	Sociology of Marginalized groups	04	SBA.SOC.605
TYBA	VI	IX	Qualitative Social Research	3.5	SBA.SOC.606

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SOCIOLOGY

TYBA PAPER IX

SEMESTER V

CREDITS 3.5

QUANTITATIVE SOCIAL RESEARCH

Course Objectives

- **To provide students with an orientation to Quantitative Social Research**
- **To acquaint students with the important concepts, techniques and methods in the quantitative social research process**
- **To enable students to apply theoretical knowledge of social research to field study. Students are required to submit a project based on original field study.**

Unit I Quantitative Research (15 Lectures)

a. Quantitative Research – Nature, characteristics, significance, critique
b. Main steps in quantitative research
c. Writing research proposal and research report

Unit II Aspects of Quantitative Research (15 Lectures)

a. Survey Method,
b. Technique of Questionnaire
c. Sampling

Unit III Quantitative Data Analysis (Univariate Analysis) (15 Lectures)

a. Measures of Central Tendency , Measures of Dispersion
b. Correlation
c. Use of computers in research
d.

Project Work: (20 Marks) Predominantly minor survey (The teacher should provide a brief orientation into the following: Formulation of research problem, Literature search, statement of the problem,

Course Outcomes: The learner will be able to -

- **Have a serious and scientific orientation to Quantitative Social Research**
- **Understand and operationalise the important concepts, techniques, and processes in quantitative research**
- **Apply theoretical knowledge of social research to field study.**
- **Plan and conduct a simple research project based on primary data**

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SOCIOLOGY

TYBA PAPER IX

SEMESTER VI

CREDITS 3.5

QUALITATIVE SOCIAL RESEARCH

Course Objectives

- **To provide students with an orientation to Qualitative Social Research**
- **To acquaint students with the important concepts, techniques, and processes in qualitative research**
- **To enable students to apply theoretical knowledge of social research to field study. Students are required to submit a project based on original data collection.**

Unit I Qualitative Research (15 Lectures)

a. Qualitative Research – Nature, characteristics, significance, critique
b. Distinction between qualitative and quantitative research
c. Reliability and validity in qualitative research- Triangulation

Unit II Qualitative approaches to enquiry (15 Lectures)

a. Ethnography
b. Case study
c. Feminist approach

Unit III Methods and Techniques of data collection (15 Lectures)

a. Interview: Unstructured, Semi structured, In-depth
b. Focus Group discussion
c. Narrative Analysis
d. Conversation and Discourse analysis

Project Work (20 Marks) Predominantly a minor data collection project (The teacher should provide a brief orientation into the following: Formulation of research problem, Literature search, objective operationalization, statement of the problem, Conceptualization, data collection, interpretation and report writing.

Course Outcomes: The learner will be able to -

- **Have a serious and scientific orientation to Qualitative Social Research**
- **Understand and operationalise the important concepts, techniques, and processes in qualitative research**
- **Apply theoretical knowledge of social research to field study**
- **Plan and conduct a simple research project based on primary data**

SOPHIA COLLEGE (AUTONOMOUS)

Affiliated to

UNIVERSITY OF MUMBAI

Programme: Microbiology

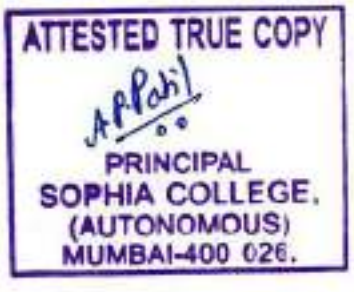
Programme code: SMSMCB

M.Sc.-II Microbiology

(Choice Based Credit System with effect from the year 2021-2022)

Programme Outline: M.Sc.-II Microbiology (SEMESTER III)

Course code	Unit No	Name of the Unit	Credits
SMSMCB301		RESEARCH METHODOLOGY	4
	1	Basics of Research	
	2	Sampling, data collection, interpretation and report writing.	
	3	Scientific writing and ethics in research and publication.	
	4	Biostatistics	
SMSMCB302		FOOD MICROBIOLOGY	4
	1	Microbes in Food	
	2	Use of Microbes and their products in in Food industry	
	3	Control of Microbes in Food	
	4	Microbiological quality of Food	
SMSMCB303		ADVANCES IN BIOTECHNOLOGY-I	4
	1	Plant and Agricultural Biotechnology	
	2	Animal Biotechnology	
	3	Nanobiotechnology	
	4	Medical Biotechnology	
SMSMCB304		ENVIRONMENTAL MICROBIOLOGY-I	4
	1	Microbial Ecology	
	2	Soil, Plant and Marine Microbiology	
	3	Cultural and Physiological Methods for Studying Microorganisms in the Environment	
	4	Immunological and Nucleic acid Methods for Studying Microorganisms in the Environment	
SMSMCBP3		PRACTICALS	
SMSMCBP301		Research proposal writing	2
SMSMCBP302		Food Microbiology	2
SMSMCBP303		Advances in Biotechnology-I	2
SMSMCBP304		Environmental Microbiology-I	2



Programme Outline: M.Sc.-II Microbiology (SEMESTER IV)

Course code	Unit No	Name of the Unit	Credits

SMSMCB401		TOOLS AND TECHNIQUES: BIOMOLECULAR ANALYSIS	4
	1	Advanced Microscopy techniques	
	2	Spectroscopic techniques	
	3	Chromatographic techniques	
	4	Molecular biology techniques.	
SMSMCB402		PHARMACEUTICAL MICROBIOLOGY	4
	1	Main principles for pharmaceutical products	
	2	Premises and personnel management	
	3	Sterility in pharmaceutical products and other principles	
	4	Drug discovery	
SMSMCB403		ADVANCES IN BIOTECHNOLOGY-II	4
	1	Pharmaceutical Biotechnology and Bioethics	
	2	IPR and innovations, startups and Entrepreneurship	
	3	Microbial biofuels	
	4	Synthetic Biology	
SMSMCB404		ENVIRONMENTAL MICROBIOLOGY-II	4
	1	Extremophiles	
	2	Impact of Microorganisms on Environment	
	3	Environmental Monitoring and Water Pollution	
	4	Bioremediation and Waste treatment	
SMSMCBP4		PRACTICALS	
SMSMCBP401		Dissertation submission and presentation	2
SMSMCBP402		Pharmaceutical Microbiology	2
SMSMCBP403		Advances in Biotechnology-II	2
SMSMCBP404		Environmental Microbiology-II	2

PREAMBLE:

The M.Sc program at Sophia College (Autonomous) is open to both female and male students. The M.Sc course is an extension of the undergraduate curriculum dealing with all the branches of Microbiology at a considerable depth and blends the upcoming fields as well as advances in the subject. Research is an integral aspect of the curriculum and includes planning and execution of a dissertation. The outcomes of a number of the dissertations have been published in peer reviewed journals. Participation and presentations - both oral and posters in conferences, workshops and

research meets is encouraged. Field projects, Educational visits and short-term internships are also included. The students who complete the postgraduate programme in Microbiology are well trained in the subject and find employment in areas like Quality control, Research and Development, Clinical Research, Teaching etc.

Program Objectives

PO1	To provide in depth knowledge to the learners in the conventional and emerging areas of Microbiology.
PO2	To help learners plan and execute research projects.
PO3	To train the learners to communicate the findings of the research projects effectively.
PO4	To create awareness among the learners about regulatory requirements and compliance, IPR and ethics.

PROGRAMME SPECIFIC OUTCOMES

PSO1	The learner will gain and apply knowledge about recent developments in Genetics, Virology, Cell Biology, Microbial Biochemistry, Medical Microbiology and Immunology, Environmental Microbiology, Food and Dairy Microbiology etc in order to solve problems affecting mankind.
PSO2	The learner will acquire knowledge about research methodology, plan and execute experiments using good laboratory practices, and interpret the experimental results effectively.
PSO3	The learner will be able to communicate their findings by virtue of doing poster /oral presentations in conferences/workshops, writing thesis, research papers, reports etc
PSO4	The learners will gain knowledge of regulatory compliance in various fields like clinical research, IPR and ethics by attending value added courses/seminars/webinars etc which may lead to employability.

SEMESTER 3

NAME OF THE COURSE	RESEARCH METHODOLOGY
CLASS	MSc-II
COURSE CODE	SMSMCB301
NUMBER OF CREDITS	4

NUMBER OF LECTURES PER WEEK	4	
TOTAL NUMBER OF LECTURES PER SEMESTER	60	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	50	50
PASSING MARKS	20	20

COURSE OBJECTIVES:

CO 1	To educate about the process of research, types of research and research design.
CO 2	To understand the detailed methodology involved in writing a research proposal.
CO 3	To analyze the different types of sampling methods, sampling designs and variables. To learn about methods of data collection, interpretation and report writing.
CO 4	To develop skills in scientific writing and understand ethics in research and publication.
CO 5	To use ICT as a tool to assist in writing research proposals and research outcomes
CO 6	To use biostatistics software in interpretation of data.

COURSE LEARNING OUTCOMES:

CLO 1	The learner will be able to explain the process of research and differentiate between types of research.
CLO 2	The learner will be able to design a research plan.
CLO 3	The learner will be able to use appropriate methods of sample collection, methods of carrying out research and write a report on the same.
CLO 4	The learner will be able to write a research proposal, use anti plagiarism software to check if the proposal follows all principles of ethics in research and publication.
CLO 5	The learner will write a report for presentation in written and oral format using ICT.
CLO 6	The learner will be able to use the biostatistics software so that it can be applied to the data collected for validity and interpretation.

UNIT 1	Basics of Research (15 Lectures)
1.1	Meaning and objectives of research, research and scientific method, research process, research methods vs methodology. Criteria of good research, Problems encountered by researchers in India. (07L)
1.2	Types of research, conceptual vs empirical, applied vs fundamental, descriptive vs analytical, qualitative vs quantitative. (04L)
1.3	Research designs: Features of a good research design, different research designs. Case study, cross over study, case control design, cohort study design, multifactorial design, ex post facto. (04L)
UNIT 2	Sampling, data collection, interpretation and report writing (15 Lectures)

2.1	Sampling and sampling design: Steps and different types of sample design. Methods of sampling: non probability, simple random, systematic, stratified, quota, cluster and area sampling, multistage and sequential sampling. Problems due to unintended sampling, ecological and statistical population in the laboratory. (04L) Variables: Nominal, ordinal, discontinuous and continuous.(02L)
2.2	Collection of data: Methods and techniques of data collection. Types of data collection: Primary and Secondary. Methods of primary data collection: Observation, Experimentation, Questionnaire, Interview, Schedules, Case pilot study etc. Methods of secondary data collection- Internal and External. (06L)
2.3	Interpretation and report writing: Techniques of interpretation and different steps involved in report writing, types of report, mechanics of writing a research report. (03L)
UNIT 3	Scientific writing and Ethics in research and publication (15 Lectures)
3.1	Abstract. Writing of Literature review, Aim and Objectives Methodology. References/ Bibliography and Preparation of manuscript for publication of research/ review paper. Peer reviewed, UGC CARE listed, indexed journals, citation index and role of citation, impact factor of a journal. Use of open sources such as Mendeley reference manager, LaTeX as writing software, storage using Google drive/ Dropbox. Science journalism. (07 L)
3.2	Use of computers in research: Computer technology, computer and researchers, software tools in the structure, design and preparation of thesis, layout, labeling of figures, legends, preparation of tables, layout, etc. Preparation of oral presentation and posters. (04L)
3.3	Ethics in research and publication: Citations, acknowledgement, conflict of interest, plagiarism, plagiarism checking tools. Overview of ethics in research: Overview of legislation and regulation, ethical guidelines in animal and clinical research. IPR and patent law. (04L)
UNIT 4	Biostatistics (15 Lectures)
4.1	Basics of Biostatistics: Measure of central tendencies, mean, mode, median. Measure of dispersion, Standard deviation, Standard error of means, P value concept. Use of appropriate software for computation of statistical data (05L)
4.2	Types of hypothesis: Basics concepts, types of hypothesis - Null and Alternate hypothesis, levels of hypothesis and testing of hypothesis.Parametric test: Z test, t test (1 tailed and 2 tailed test) of hypothesis. Different types of ANOVA test Non parametric test. (06L)
4.3	Correlation analysis & Regression analysis: interpolation and extrapolation, nonlinear data fitting, probit analysis etc. Software used for all of the above. (04L)
	Student activity: A hands-on workshop will be organized to help students learn about the various biostatistics softwares. A talk will be organized to inform students on how to go about writing scientific articles to promote science journalism as a career choice

REFERENCES:
SMSMCB301

NAME OF THE COURSE	RESEARCH PROPOSAL WRITING	
CLASS	MSc-II	
COURSE CODE	SMSMCBP301	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	4	
TOTAL NUMBER OF LECTURES PER SEMESTER	60	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	-	50
PASSING MARKS	-	20

CO 4	To write Aims and Objectives.
CO 5	To propose appropriate materials and methods in order to conduct the research
CO 6	To comment on the expected results.
CO 7	To write references using APA, Harvard style etc.
CO 8	To write a budget for conducting the research project
CO 9	To present the research proposal.

COURSE LEARNING OUTCOMES:

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CLO 1	The learner will be able to select a research topic and design a research plan in consultation with the guide and keeping in mind the facilities provided by the department and common instrument facility available in other science departments.
CLO 2	The learner will be able to justify the need to carry out the proposed research work, highlight the interdisciplinary relevance and propose a hypothesis.
CLO 3	The learner will be able to review primary and secondary sources of data in order to collect literature in an hope to explore areas which have not been researched so far if possible, especially applications.
CLO 4	The learner will be able to write aims and list the objectives of carrying out the research project.
CLO 5	The learner will be able to describe the procurement and use of materials in the order to carry out the research. Also To propose appropriate materials and methods in order to conduct the research
CLO 6	The learner will be able to discuss the expected results after carrying out the key steps of the research project.
CLO 7	The learner will be able to write in text references and also list at least 25 references using APA, Harvard style etc at the end of the proposal.
CLO 8	The learner will be able to list the cost of the chemicals, glassware, instrumental analysis etc carried out during the research project.
CLO 9	The learner will be able to prepare a research proposal of about 25 -30 pages using ICT, check it for plagiarism and also present the same in the form of a Powerpoint presentation during the practical examination.

Sr.no	Name of the experiment
1	Research proposal writing. Hypothesis, Literature survey.
2	Plan of work and methodology.
3	Using anti plagiarism software to check the validity of the proposal.
4	Research proposal preparation using ICT tools and presentation using poster and defense.

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6	Efficacy testing of preservatives.

NAME OF THE COURSE	ADVANCES IN BIOTECHNOLOGY-II PRACTICAL	
CLASS	MSc-II	
COURSE CODE	SMSMCBP403	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	4	
TOTAL NUMBER OF LECTURES PER SEMESTER	60	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	-	50
PASSING MARKS	-	20

COURSE OBJECTIVES

CO 1	To understand the criteria for patentability and the process of obtaining patents.
CO 2	To understand the fundamental principles of ethics and identify the key ethical concerns related to biotechnology
CO 3	To inculcate an entrepreneurial mindset in students
CO 4	To screen potential algal strains as potential sources of biofuel based on lipid content staining and lipid extraction.
CO 5	To expose students to industrial applications of biotechnology.
CO 6	To update students with case studies of successful entrepreneurs in the field of biotechnology.
CO 7	To update students with artificial intelligence applications in the field of biotechnology.

COURSE LEARNING OUTCOMES

CLO 1	The learner will be able to understand the process of obtaining patents.
CLO 2	The learner will be able to understand the importance of intellectual property rights in protecting innovations and managing IP in biotechnology
CLO 3	The learner will be able to explore areas in biotechnology for setting up a business.
CLO 4	The learner will be able to screen algal strains for biofuel production by performing Nile red staining and estimating the lipid content.
CLO 5	The learner will be able to connect theoretical information with implementation in an industrial context.
CLO 6	The learner will be able to analyze how individuals were able to translate the theoretical information into commercially viable case applications in the field of biotechnology.
CLO 7	The learner will be able to cite examples of the recent developments in the rapidly evolving field of artificial intelligence in the area of biotechnology.

Sr. No	Name of the experiment
1	Assignments on IPR-Case studies on different patents granted
2	Report on International Bioethics survey on specific concerned issues
3	1 page description of student's business idea
4	Lipid staining of microalgae - Nile red / Sudan black B staining
5	Extraction of lipids from microalgae
6	Visit to Pharmaceutical industry
7	Case study- The Successful Entrepreneur
8	AI and Biotechnology- student seminars

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(AUTONOMOUS)
MUMBAI-400 026.

SOPHIA COLLEGE (AUTONOMOUS)

Affiliated to

University of Mumbai

Program: Life Sciences

Program Code: SMSLSC

M.Sc.

Course: (Choice Based Credit System with effect from the year 2022-2023)

Programme Outline: M.Sc. Life Sciences SEMESTER III

COURSE CODE	UNIT	TOPIC HEADINGS	CREDITS	LECTURES
Paper I	**Cellular Organization of the Nervous System**			
SMSLSC301	1	History of Neuroscience Nervous system: Overview and Evolutionary Perspective	4	15
	2	Neuron and Glia: Structure, Functional features and electrical properties.		15
	3	Synaptic Transmission.		15
	4	Electrophysiological techniques and Computational Neuroscience		15
SMSLSCP301	Practical		2	
Paper II	**Organization and functional modification of the nervous system**			
SMSLSC302	1	Nerve and Muscle physiology	4	15
	2	Neuroimmunology		15
	3	Gut microbiome and nervous system		15
	4	Advanced Neurogenetics, imaging techniques Advanced Biostatistics		15
SMSLSCP302	Practical		2	
Paper III	**Systems approach to Neurosciences I**			
SMSLSC303	1	Anatomical and Functional organization of the CNS	4	15
	2	Anatomical and functional organization of the PNS		15
	3	Autonomic/ Enteric Nervous system Implications of pathogenic diseases		15
	4	Neuroimaging Technique		15
SMSLSCP303	Practical		2	
Paper IV	**Systems approach to Neurosciences II**			
SMSLSC304	1	Sensory system I	4	15
	2	Sensory system II		15
	3	Motor System		15
	4	Bioethics		15
SMSLSCP304	Practical			

SEMESTER IV

COURSE CODE	UNIT	TOPIC HEADINGS	CREDITS	LECTURES
Paper I	**Developmental Neurobiology**			
SMSLSC401	1	Developmental Neurobiology	4	15
	2	Axon Guidance and Synapse formation		15
	3	The Altered Brain		15
	4	Developmental disorders and genetic diseases		15
SMSLSCP401	Practical		2	
Paper II	**Behavioral Neurobiology I**			
SMSLSC402	1	Brain and Behaviour	4	15
	2	Cognitive development and Behavioral Disorders		15
	3	Emotion		15
	4	Sleep and Dreams, Consciousness		15
SMSLSCP402	Practical		2	
Paper III	**Behavioral Neurobiology II**			
SMSLSC403	1	Learning and Memory- I	4	15
	2	Learning and Memory- II		15
	3	Language and speech		15
	4	Neuroeconomics and Neuromarketing		15
SMSLSCP403	Practical		2	
Paper IV	**Molecular Neurobiology and Disease pathology**			
SMSLSC404	1	Neurotoxicology and Neuropharmacology	4	15
	2	Neurodegenerative diseases		15
	3	Recent Techniques in Experimental Neurosciences		15
	4	IPR & Neuroethics		15
SMSLSCP404	Practical		2	

NAME OF THE COURSE	SYSTEMS APPROACH TO NEUROSCIENCES I	
CLASS	M.Sc. Sem III	
COURSE CODE	SMSLSC303	
NUMBER OF CREDITS	4	
NUMBER OF LECTURES PER WEEK	4	
TOTAL NUMBER OF LECTURES PER SEMESTER	30	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	50	50
PASSING MARKS	20	20

Course Objectives:

CO 1	To enable the understanding of anatomical and functional organization of the nervous system
CO 2	To demonstrate the comprehensive information about the structure, organizations and functional connectivity of the CNS and PNS.

Course Learning Outcomes :
Students will be able to

CLO 1	Categorize the autonomic and enteric nervous system and also with the integration of autonomic and endocrine functions with behavior.
CLO 2	Further the implications of pathogenic diseases along with the neuroimaging techniques

UNIT 1	**Anatomical and Functional Organization of the CNS:**	**(15 Lectures)**
	1) Major divisions of Nervous System–Spinal cord, Medulla, Pons and Brain stem, Midbrain, Cerebellum, Diencephalon, Cerebral Hemispheres 2) Orientation of the above components in the CNS with respect to [illegible] axes. 3) Gross anatomy of the brain with reference to functional organization of [illegible]ior	

	2. Electrical response to light. Concept of receptive fields. 3. Color vision Visual pathway, lateral geniculate nucleus and visual cortex 4. Visual perception as a creative process. 5. Perception of motion, depth, form and color. 6. Visual attention and conscious awareness.
UNIT 2	**Sensory system II:** **(15 Lectures)**
	A. Auditory system: 1. Functional anatomy of ear and cochlea. 2. Cochlear hair cells and perception of stimulus (frequency and intensity). 3. Mechano-electrical transduction hair cells. 4. Adaptation to sustained stimuli 5. Role of brainstem nuclei, processing of auditory information in the cerebral cortex. 6. Vestibular system and perception of posture and movement. **B. Olfactory system:** 1. Structure of olfactory epithelium and odorant receptors. 2. Role of nasal olfactory neuron in odour detection 3. Olfactory signal transduction. 4. Spatial encoding of odorant information in the olfactory bulb. Processing of olfactory information in the cerebral cortex. **C. Gustatory system:** 1. Taste buds and their localization in various types of papillae found in human tongue. 2. Taste cell: transduction of 4 basic stimuli into electrical signal Pathways to the CNS. **D. Somatosensory system:** 1. Touch and mediation by mechanoreceptors in skin. 2. Warmth and cold mediation by thermal receptors. Pain mediation by nociceptors. Role of spinal cord and cerebral cortex in somatosensation.
UNIT 3	**Motor System:** **(15 Lecture)**
	1. General introduction to motor system. 2. Reflex and contractions. Rhythmic movements produced by stereotype muscle. Voluntary movements 3. Motor circuits in spinal cord, brain stern, and fore brain 4. Influence of basal ganglia and cerebellum on cortical and brain motor mechanisms. 5. Motor function of the brain stem, vestibular apparatus and equilibrium Motor functions of the spinal cord-reflexes 6. Diseases of the Nervous System– Parkinson's Disease
UNIT 4	**Bioethics** **(15 Lectures)**
	Bioethics 1. Bioethics: Definition – moral, values, ethics and ethics in biology and

	importance of ethics in biology; 2. Basic Approaches to Ethics; Post humanism and Anti-Post humanism; 3. Bioethics in healthcare, agriculture, modern biology, biotechnology, animal welfare & right / animals in research, wildlife conservation and management, commercialism in scientific research 4. Bioethics and cross-cultural bioethics – 5. Autonomy, Rights, Beneficence, Do No Harm, Justice, Confidentiality, Animal Rights, Environmental ethics, Mixed Perception of Benefit & Risk, 6. Reasoning behind Acceptance or Rejection of Genetic Manipulation, Concerns about Consuming products of GMOs Past and Present 'Bioethical Conflicts' in Biotechnology-Interference with Nature,Fear of unknown, Regulatory concerns, Human misuse. 7. Introduction to IPR: Types of Intellectual property – Patents, Trademarks, Copyrights and related rights.

NAME OF THE COURSE	**Practicals**
CLASS	M.Sc. Sem III
COURSE CODE	SMSLSCP304
NUMBER OF CREDITS	2
NUMBER OF LECTURES PER WEEK	4
TOTAL NUMBER OF LECTURES PER SEMESTER	60
EVALUATION METHOD	SEMESTER END EXAMINATION
TOTAL MARKS	50
PASSING MARKS	20

Course code	Practical title
SMSLSCP304	1. Anatomy of the chick brain –display of ventral and dors

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	10. Evolutionary Perspective of Decision- Making A. Neural Marketing 1. What is Neuromarketing? 2. Role of Attention & Consciousness and Learning & Memory 3. Sensory Neuromarketing 4. Emotions & Feelings, Wanting & Liking 5. Neuroethics and Consumer Aberrations

NAME OF THE COURSE	Practicals
CLASS	M.Sc. Sem IV
COURSE CODE	SMSLSCP403
NUMBER OF CREDITS	2
NUMBER OF LECTURES PER WEEK	4
TOTAL NUMBER OF LECTURES PER SEMESTER	60
EVALUATION METHOD TOTAL MARKS PASSING MARKS	SEMESTER END EXAMINATION 50 20

Course code	Practical title
SMSLSCP403	Thesis containing Literature Review, Project work, Poster presentation in any conference (MANDATORY) Good Laboratory Practices.

NAME OF THE COURSE	MOLECULAR NEUROBIOLOGY AND

UNIT 1	**Neurotoxicology and Neuropharmacology** **(15 Lectures)**
	A. Neurotoxicology: 1. General principles of toxicology and neurotoxicology 2. Effect of injurious chemicals / agents / environmental factors on the nervous system and their mechanisms of action. Neurotoxicity of metals and cellular mechanisms. 3. Model systems and methods used to study neurotoxicology Effects of toxins on neurodevelopment. **B. Nanoparticles:** 1. Cell – nanoparticle interface. 2. Other applications of nanoparticles in neuroscience – Imaging, Drug / Gene delivery (across Blood brain barrier)
UNIT 2	**Neurodegenerative diseases** **(15 Lectures)**
	A. Molecular basis of neurodegenerative diseases 1. Infectious Diseases 2. Leprosy 3. Prions Disease **B. Degenerative diseases of the Nervous system** 1. Genetic mechanisms – Huntington's Disease, Duchenne Muscular Dystrophy Myopathies and Neuropathies 2. Malnutrition Diseases – Kwashiorkor and Marasmus 3. Tumors of the CNS – neuroblastomas, medulloblastomas and gliomas
UNIT 3	**Recent Techniques in Experimental Neurosciences** **(15 Lecture)**
	A. Advances in molecular biology techniques in Neurosciences 1. Genomics: Impact of human genome project on neuroscience research Proteomics in Neuroscience 2. The connectome project **B. Molecular screens and Making and Using Transgenic organisms:** 1. cDNA microarray, RNAi screens, Nextgen sequencing. 2. Disrupting gene products and direct gene targeting: Knockouts, knockins, conditional knockouts (Cre/lox, FLP/FRT, CRIPR-Cas9, ZFNs, TALENs) RNA interference (RNAi), morpholinos, dominant negatives 3. Binary transgenic systems: Gal4/UAS, Cre/lox, Flp/Frt, Tet-off/Tet-on
UNIT 4	**IPR & Neuroethics** **(15 Lecture)**
	A. IPR patents related to neuroscience 1. Example : Piracetam, Levitracetum (a GABA derivative). 2. Levodopa and therapeutic applications. 3. Gabapentin and Neuropathic pain. 4. Ethical usage of drugs for multiple indications: Carbamazepine /Valproate. 5. Personalized drug : Thiopurine. 6. Lifestyle drugs, Assessment Neuro- technologies, Intervention

M.Sc. Part I Life Sciences Syllabus

Choice based Credit and Grading System

Academic year 2022-2023

SEMESTER I

COURSE CODE	UNIT	TOPIC HEADINGS	CREDITS
Paper I	**Macromolecules**		
SMSLSC101	1	Cell biochemistry	4
	2	Nucleic acid biochemistry	
	3	Protein biochemistry	
	4	Techniques in macromolecular biology	
SMSLSCP101	Practical		2
Paper II	**Cell Biology I**		
SMSLSC102	1	Biology of Prokaryotes	4
	2	Biology of Eukaryotes - I	
	3	Biology of Eukaryotes - II	
	4	Techniques in cell biology I	
SMSLSCP102	Practical		2
Paper III	**Systems Biology I**		
SMSLSC103	1	Physiology I- Digestive, Circulatory and Excretory Systems	4
	2	Immunology	
	3	Infectious animal and plant diseases	
	4	Techniques in Systems Biology I	
SMSLSCP103	Practical		2
Paper IV	**Ecology, Environment, Biostatistics I and Research methodology**		
SMSLSC104	1	Bioethics	4
	2	Toxicology	
	3	Biostatistics I	
	4	Research Methodology	
SMSLSCP104	Practical		

PAPER –IV BIOETHICS, TOXICOLOGY, BIOSTATISTICS AND BIOINFORMATICS

NAME OF THE COURSE	BIOETHICS, TOXICOLOGY, BIOSTATISTICS AND BIOINFORMATICS	
CLASS	MSc LIFE SCIENCES	
COURSE CODE	SMSLSC104	
NUMBER OF CREDITS	4	
NUMBER OF LECTURES PER WEEK	4	
TOTAL NUMBER OF LECTURES PER SEMESTER	60	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	50	50
PASSING MARKS	20	20

COURSE OBJECTIVES:

CO 1.	To apprehend the major classes of toxicology, different toxins, and route of exposure, risk assessment, prediction and management.
CO 2.	Demonstration and understanding of the central concepts of modern statistical theory and their probabilistic foundation.

COURSE LEARNING OUTCOMES:

CLO 1.	The students will be able to design, execute and statistically analyse experiments using the principles of scientific research methodology.
CLO 2.	The student will be able to Interpret results by using descriptive statistical methods effectively.

Unit	Topic headings

1	**Bioethics (15 Lectures)** 1. Bioethics: Definition – moral, values, ethics and ethics in biology; Role and importance of ethics in biology; 2. Basic Approaches to Ethics; Post humanism and Anti-Post humanism; 3. Bioethics in healthcare, agriculture, modern biology, biotechnology, animal welfare & right / animals in research, wildlife conservation and management, commercialism in scientific research 4. Bioethics and cross-cultural bioethics – Autonomy, Rights, Beneficence, Do No Harm, Justice, Confidentiality, Animal Rights, Environmental ethics, Mixed Perception of Benefit & Risk, 5. Reasoning behind Acceptance or Rejection of Genetic Manipulation, Concerns about Consuming products of GMOs Past and Present 'Bioethical Conflicts' in Biotechnology- Interference with Nature, Fear of unknown, Regulatory concerns, Human misuse 6. Introduction to IPR; Types of Intellectual property – Patents, Trademarks, Copyrights and related rights.
2	**Toxicology (15 Lectures)** 1. History of toxicology, classification of toxicology. 2. Toxicants: Exposure, exposure characterization. 3. Routes of exposure: Organism environment interaction, Animal and plant toxins, Absorption and distribution of toxicants, 4. Hazard identification: Risk assessment (Human health risk assessment) Risk prediction and management (management of acute intoxication, natural detoxification – biochemical and genetic mechanism)
3	**Biostatistics I (15 Lectures)** 1. Data: types of data, collection & classification, Frequency distribution, diagrammatic & graphical representation of data 2. Measures of central tendency and measures of variation/dispersion 3. Probability: Types of Probability (Mathematical & Statistical), their characteristics and limitations, Theorems of Probability- Additional, Multiplication theorem, Permutation & Combination, Random Variable, Theoretical Probability Distribution Baye's theorem 4. Normal Distribution (Z score), Binomial Distribution, Poisson Distribution 5. Correlation: Introduction, types of Correlation, method of study correlation & application. 6. Regression: Types of regression, regression lines & its properties

4	**Research Methodology: (15 Lectures)** 1. Introduction and rationale 2. Types of Research studies: Prospective or Retrospective; Case-control, Crosssectional, longitudinal (to be applied to students' actual research projects) 3. Definition and Formulation of a Problem, Designing and conducting a research project
	4. Method of data collection: Experiments, Interviews, Questionnaires and Surveys, Data records of data storage and good laboratory practices 5. Reporting: Principles of effective writing: Literature review, Report writing: Thesis/Dissertation, Grant writing 6. Types of grants: Fellowship/ Travel/ Project/Conference/Workshop & Proposal writing 7. Plagiarism in research

Reference Books

- Arora P.N. & Malhan P.K. Biostatistics, 2002, First Reprint Edition, *Himalaya Publishing House.*
- Banerjee P.K., Introduction to Biostatistics,2004, First Edition, *S. Chand & Company Pvt. Ltd.*
- Booth V., Communicating in Science: Writing a Scientific Paper and Speaking at Scientific Meetings, 2003, *Cambridge University Press.*
- Creswell J.W., Cresswell J.D., Research Design: Qualitative, Quantitative, and Mixed Method Approaches, 2017, *Sage Publications.*
- Day R. A., Gastel B., How to Write & Publish a Scientific Paper, 2011, *Greenwood.*
- Gurumani N., An Introduction to Biostatistics, 2011, Second Revised Edition, *M.J.P. Publisher.*
- Gurumani N., Research Methodology for Biological Sciences, 2006, *MJP Publishers.*
- Mahajan B.K., Methods in Biostatistics, 2002, Sixth Reprint Edition, *Jaypee Brothers Medical Publishers (P) Ltd.*
- Matthews J.R., Matthews R.W., Successful Scientific Writing: A Step-By-step Guide for the Biological and Medical Sciences, *Cambridge University Press.*
- Marczyk G., DeMatteo D., Festinger D., Essentials of Research Design and Methodology, 2010, *John Wiley and Sons, Inc.*
- Laake P., Benestad H.B., Olsen B.R., Research Methodology in the Medical and Biological Sciences, 2007, *Acad Press.*
- Santra S.C., Fundamentals of Ecology and Environmental Biology,2010, First Edition, *New Central Book Agency (P) Ltd.*

SOPHIA COLLEGE, (AUTONOMOUS)

Affiliated to

UNIVERSITY OF MUMBAI

Programme: Foundation Course

Programme Code: SBAFCO & SBSFCO

F.Y.B.A. & F.Y.B.Sc.

(Choice Based Credit System with effect from the year 2022-23)

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SOPHIA COLLEGE.
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MUMBAI-400 026.

Programme Outline : FYBA / FYBSC (SEMESTER I)

Course Code	Unit No	Name of the Unit	Credits
SBAFCO101 SBSFCO101		FOUNDATIONS OF INDIAN SOCIETY	2
	1	Rights Discourse and Indian Constitution	
	2	Ethics in Public Domain	
	3	Gender Construction in India	

Programme Outline : FYBA / FYBSC (SEMESTER II)

Course Code	Unit No	Name of the Unit	Credits
SBAFCO201 SBSFCO201		BASIC ISSUES AND CONCERNS IN INDIAN SOCIETY	2
	1	Liberalisation, Privatisation, Globalisation	
	2	Stress and Conflict	
	3	Social Conflict	

Preamble:

Foundation Course is one of the compulsory papers offered to students of the First Year Bachelor of Arts and First Year Bachelor of Science. This course offers a multidimensional exploration of critical issues impacting modern Indian society. It provides a comprehensive understanding of the forces shaping the nation's socio-economic landscape. Through this comprehensive syllabus, the course aims to equip students with a holistic understanding of the multifaceted challenges confronting Indian society. It fosters critical thinking abilities and encourages students to explore innovative solutions to address these pressing concerns, ultimately contributing to a more inclusive and harmonious societal fabric. This course equips you with the knowledge and sensitises to understand the forces shaping our world and the challenges we face together.

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SOPHIA COLLEGE,
(AUTONOMOUS)
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SEMESTER 1

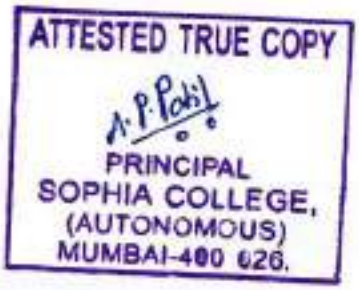
NAME OF THE COURSE	FOUNDATIONS IN INDIAN SOCIETY	
CLASS	FYBA & FYBSC	
COURSE CODE	SBAFCO101/SBSFCO101	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	3	
TOTAL NUMBER OF LECTURES PER SEMESTER	45	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	50	50
PASSING MARKS	20	20

COURSE OBJECTIVES

CO 1.	To familiarize students with the concepts, evolution of rights with special reference to the constitution of India.
CO 2.	To acquaint students with the principles and values in ethics.
CO 3.	To sensitize students about the emerging gender identities and crisis in the Indian context.

COURSE LEARNING OUTCOMES:

CLO 1.	Understand the philosophy and spirit of Indian Constitution and develop respect for human rights and acknowledge the beauty of plurality existing in the nation and a more sensitized gender attitude.
CLO 2.	Nourish in them value based principles underpinning behavior and develop proper ethical attitudes that form character.
CLO 3.	Develop a basic understanding about issues related to women and LQBTQIA+



SYLLABUS

UNIT 1	Rights Discourse and Indian Constitution (15 LECTURES)
1.1	Notion of Rights: Meaning and Characteristics
1.2	Historical Evolution of Human Rights: Natural Rights Theory and social Contract Theory; Magna Carta; English Bill of Rights; American Bill of Rights; Geneva Convention and UDHR
1.3	Constitution of India: Making and preamble
1.4	Constitution of India: Citizenship, Fundamental Rights and Directive Principles of State Policy
1.5	Crisis and challenges: Unity in Diversity
UNIT 2	Ethics in Public Domain (15 LECTURES)
2.1	Meaning and Perspectives in Ethics
2.2	Values in action: Truthfulness (transparency and accountability), Non-violence, compassion, Fellowship, Integrity
2.3	Ethical practices in Research and Writing
2.4	Professional Ethics: Medical and Media
2.5	Professional Ethics: Legal, Business and Teaching
UNIT 3	Gender Construction in India (15 LECTURES)
3.1	Concepts -Gender, Patriarchy and Feminism
3.2	Violence against Women – Female Foeticide, Female Infanticide, Malnutrition, Sexual Harassment, Sexual Assault, Dowry, Honour Killing
3.3	Social and Economic Discrimination of Women
3.4	LGBTQIA+ : Concepts and Problems
3.5	LGBTQIA+: Legal provisions in India and LGBTQIA+ Movement

SOPHIA COLLEGE, (AUTONOMOUS)

Affiliated to

UNIVERSITY OF MUMBAI

Programme: Zoology

Programme Code: SBSZOO

S.Y.B.Sc. Zoology

(Choice Based Credit System with effect from the year 2022-23)

Programme Outline: SYBSc Zoology (SEMESTER III)

Course Code	Unit No	Name of the Unit	Credits
SBSZOO301		CLASSIFICATION OF CHORDATES & DEVELOPMENTAL BIOLOGY	2
	1	Classification of Chordates	
	2	Human Reproduction	
	3	Developmental Biology	
SBSZOO302		CELL BIOLOGY & GENETICS	2
	1	Cell Biology	
	2	Genetics	
	3	Nucleic Acids and Chromosomes	
SBSZOO303		RESEARCH METHODOLOGY & APPLIED ZOOLOGY - I	2
	1	Research Methodology	
	2	Parasitology	
	3	Pollution	
SBSZOOP3		Practical I	3
		Practical II	
		Practical III	

Programme Outline: SYBSc Zoology (SEMESTER IV)

Course Code	Unit No		Credits
SBSZOO401		LIFE PROCESSES	2
	1	Nutrition & Excretion	
	2	Respiration & Circulation	
	3	Locomotion & Control and Coordination	
SBSZOO402		BIOCHEMISTRY& HISTOLOGY	2
	1	Enzymology	
	2	Molecular biology	
	3	Histology	
SBSZOO403		APPLIED ZOOLOGY - II	2
	1	Economic Entomology	
	2	Fisheries	

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NAME OF THE COURSE	RESEARCH METHODOLOGY AND APPLIED ZOOLOGY- I	
CLASS	SYBSc Zoology	
COURSE CODE	SBSZOO303	
NUMBER OF CREDITS	2	
NUMBER OF LECTURES PER WEEK	3	
TOTAL NUMBER OF LECTURES PER SEMESTER	45	
EVALUATION METHOD	INTERNAL ASSESSMENT	SEMESTER END EXAMINATION
TOTAL MARKS	50	50
PASSING MARKS	20	20

COURSE OBJECTIVES:

CO 1.	To understand the concept of Scientific Research Methodology
CO 2.	To gain knowledge about the elements of research methodology
CO 3.	To understand the ethical guidelines pertaining to research and publication
CO 4.	To introduce the learner to life cycle, pathogenicity, control measures and treatment of different parasites
CO 5.	To make the learners aware of the different types of pollution, its impact on nature and abatement measures

COURSE LEARNING OUTCOMES:

CLO 1.	Understand the difference between research methods and research methodology
CLO 2.	Relate between the research and publication ethics
CLO 3.	Relate the host-parasite relationships through the study of different parasites
CLO 4.	Evaluate the adverse effects of pollution, its impact on biodiversity and control measures.

UNIT 1	Research Methodology (15 LECTURES)
1.1	Process of science 1.1.1 A dynamic approach to investigation: The Scientific method, Deductive reasoning and inductive reasoning, Critical thinking, Role of chance in scientific discovery(serendipity) 1.1.2 Scientific research: Definition, difference between method and methodology, characteristics, types 1.1.3 Steps in the Scientific method: Identification of research problem, formulation of research hypothesis, testing the hypothesis using experiments or surveys, preparing research/study design including methodology and execution (appropriate controls, sample size, technically sound, free from bias, repeat experiments for consistency), documentation of data, data analysis and interpretation, results and conclusions 1.1.4 Dissemination of data: Reporting results to scientific community (publication in peer- reviewed journals, thesis, dissertation, reports, oral presentation, poster presentation) 1.1.5 Application of knowledge: Basic research, Applied and Translational research
1.2	1.2 Scientific writing 1.2.1 Structure and components of a research paper: preparation of manuscript for publication of research paper- title, authors and their affiliations, abstract, keywords and abbreviations, introduction, material and methods, results, discussion, conclusions, acknowledgement, bibliography; figures, tables and their legends 1.2.2: Peer reviewed and Indexed journals, Citation index and Role of citations, impact factor of a journal
1.3	1.3 Writing a review paper 1.3.1 Structure and components of review paper 1.3.2 Report writing and types of report 1.3.3 Computer application: Plotting of graphs, Statistical analysis of data. 1.3.4 Internet and its application in research-Literature survey, online submission of manuscript for publication
1.4	1.4 Ethics 1.4.1 Ethics in animal research: The ethical and sensitive care and use of animals in research, teaching and testing, approval from Dissection Monitoring Committee (DMC), CPCSEA and IAEC 1.4.2 Ethics in clinical research: Approval from clinical research ethics committee

2022-23

Concepts Unlimited

Science Education and Research Center

Date : 17/06/2022

Memorandum of Understanding

This memorandum of understanding between CONCEPTS UNLIMITED Science education & research center and SOPHIA COLLEGE (Autonomous), Mumbai.

These two institutes are working collaboratively on RUSA project. This project will be executed for grade 7 standard students of two schools.

Responsibilities:

Concepts Unlimited would provide educational material to perform experiments (like online pdf, videos), guidance to school teachers and will help Dr. Prabha Shetty for lab set up. Seven demonstrative experiments would be conducted in the selected school apart from the set of main experiments as per the state board curriculum. All rights reserved for educational material.

Dr. Prabha Shetty from Sophia college would undertake the complete responsibility of procuring lab material, making kits, distributing it to the selected schools, Coordination with concepts unlimited, Analysis of survey and difficulty solving for schools.

Signature

By Concepts Unlimited

Dr. Manasi Rajadhyaksha
Director, Concepts Unlimited

By Sophia College

Dr. Prabha Shetty
HOD, Department of Chemistry

Dr. Anagha Tendulkar Patil
Principal,
Sophia College (Autonomous)
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(AUTONOMOUS)

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