Part A Introduction			
Program: Certificate	Class: BSc-I SEM	Year:2022	Session: 2022-23
Subject: Botany			

1	Course Code	S1-BOTA2T
2	Course Title	Basic Botany
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Minor
4	Pre-requisite (if any)	To study this course, a student must have had the subject botany in class/12th/ certificate/diploma.
5	Course Learning outcomes (CLO)	• This course will help the student to understand the diversity of plants and evolutionary process in plant kingdoms. • It gives an accounts of plant adaptations from aquatic condition to colonize terrestrial habitat. • The changes in morphological, anatomical and reproductive structures that propel plant evolution can be investigated. • The economic importance and significance of plants in nature will be understood. • They will be acquainted with locally prevalent microbial diseases of plants and humans
6	Credit Value	4 Credits
7	Total Marks	Max. Marks: 60 +40 Min. Passing Marks: 35

Part B- Content of the Course

Total No. of Lectures- 60Tutorials- 0 Practical =0 (theory 4 hours per week): L-T-P:

Unit	Topics	No. of Lectures
I	1.1 History of Botany and Indian Contributions. 1.2Morphological Characteristics of lower and higher plants(Angiosperms). 1.3Types of leaves. Inflorescence, Flowers and Fruits. 1.4 Structure of Plant cell and cell organelles, Prokaryotic and Eukaryotic Cells, types of Cell division. 1.5 Microscope structure and function of light microscope (magnification and resolving power), 1.6 Various types of Microscopes: Bright field, Phase Contrast, SEM and TEM.	12
II	1. Algae 1.1General characteristics 1.2Range of thallus organization, reproduction. 1.3Types of life-cycles in algae 1.4 Role of algae in nature and its economic importance.	12

Pteridophyta, Gymnosperms, Fungi, Mycobionts, Lichens, Bacteria, Virus

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested **Readings:**

I Oladele Ogunseitan, Microbial Diversity: Form and Function in Prokaryotes, Wiley Blackwel1,2008.

2. Pelczar, M.J et al., Microbiology, Tata McGraw-Hill Co, New Delhi,5th edition, 2001.
3. Presscott, L. Harley, J. and Klein, **D.,** Microbiology, Tata McGraw- Hill Co. New Delhi,6th edn., 2005.
4. Fritsch F.E., The Structure & Reproduction of Algae, Vol. I & Vol. 11., CambridgeUniversity Press, Cambridge, U.K. 1945.
5. Smith, G.M., Cryptogamic Botany, Vol. I: Algae, Fungi, & Lichens, McGraw-Hill Book Co., New York, 1955.
6. IanMorris,An Introduction to the Algae, Hutchinson, London, 1967.

Part A Introduction			
Program: Certificate	**Class: I st** SEM	**Year: 2022**	**Session:** 2022-23
Subject : Botany Practical			

1	**Course Code**	**S1-BOTA2P**
2	**Course Title**	**Basic Botany Practical**
3	**Course Type (Core Course/Elective/Generic Elective/Vocational/.....)**	Minor
4	**Pre-requisite (if any)**	To study this course, a student must have had the subject of Biology/ Life science/Agriculture in class 12th.
5	**Course Learning outcomes (CLO)**	• **Students will learn** to carry out practical work in the laboratory, • Interpreting plant morphology and anatomy of various groups of lower and higher plants. • Students will be able to identify the major groups of microorganisms.
6	**Credit Value**	**2 Credits**
7	**Total Marks**	Max. Marks: 60+40 Min. Passing Marks: 35

Part B- Content of the Course

OTotal No. of Practical- 30 HoursTutorials- 00 -Practical (2 hours per week): L-T-P:

Unit	Topics	No. of Practical
I to VI	1. Study of various types of leaves , inflorescence, Flowers and fruits. 2. Understanding various parts of Microscope(simple and compound microscope) 3. Study of plant cells (e.g. Onion etc.) 4. Study of permanent slides of Mitosis and meiosis 5. Study of Electron Micrographs of Cell and organelles from Internet, You -Tube. 6. Identification of various algae from specimens, slides and temporary mounts of water from nearby areas like, *Noslo•, Os•illato•ia, Volvox, Spirokira, Oedogonium, Chard* and specimens and pictographs of marine algae like *Ectoccupu.s., Sargassinn, Polysiphonia.* 7. Study and identification of some Bryophytes like *Riccia, Marchaniia, Anthoceros,* F1117Cl•ia *and* Field visit. 8. Study of some fossils (specimens and slides) 9. Study of some Pteridophytes like *Ly•opodium, Sellaginella, Equisenun, Marselia* andstudy of any one fern	**30**

Keywords/Tags: Microscope, Algae, Bryophyta, Pteridophyta, Gymnosperm Fungi

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

1. Bendre Ashok and Ashok Kumar , A Textbook of Practical Botany, vol. 1, Rastogi Pub., Meerut, 1984.
2. Pandey B.PModern Practical Botany,., vol. I, S. Chand and Co. Ltd., N: Delhi, 17th edn., 1999.
3. Singh M.P., Chaudhary S.B. and Sahu H. BA Textbook of Practical Botany,Daya Pub. House, N. Delhi, 2005.
4. Shahezad, Aki I Mohd., Practical Botany, Shanti Prakashan, Gwalior, 2016.
5. Elizabeth Margaret and Angela GPractical manual of Botany, vol.1, New Age (Pub.) Ltd., Delhi, 2007.

Suggestive digital platforms web links --

Suggested equivalent online courses: ---

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Program- CERTIFICATE	Class- B.Sc.	Year- First SEM	Session- 2022-23

Subject – Chemistry

	Course Code	S1-CHEM2T	
	Course Title	**Analytical Chemistry**	
	Course Type	Minor	
	Pre-requisite (if any)	To study this course students must have had the subject Chemistry in class +2 or equivalent.	
	Course Learning Outcomes (CLO)	By the this course students will learn thefollowing aspects of Chemistry: 1. Basic concepts of Mathematics for Chemists. 2. Fundamentals of analytical chemistry andsteps involved in analysis. 3. Basic Knowledge of Computer for chemists. 4. Basic Concepts of Chemical equilibrium. 5. Principles of Chromatography and chromatographic techniques. 6. Various techniques of Spectroscopic Analysis.	
	Credit Value	4	
	Total marks	Maximum Marks: CCE- 40 University Exam (UE)- 60	Minimum Passing Marks: 35

Part B – Content of the course		
Total No. of Lectures-Tutorials-Practical (In hours per week): L-T-P: 90-0-30		
Unit	**Topic**	**No. of Lectures**
1	**Mathematics for Chemists** Straight line equation, Logarithmic relation, curve sketching, linear graphs & calculation of slopes. Differentiation, differentiation of functions like k_x, e^x, x^n, sinx, logx, maxima & minima, partial differentiation. Integration of some useful relevant functions. ***Keywords/Tags:*** *Linear graphs, Logarithmic Relation, Differentiation, Integration.*	10
2	**Basic Analytical Chemistry:** Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurement . Presentation of experimental data and results, from the point of view of significant figures, statistical terms: mean, mean deviation, median standard deviation, Numerical Problems. **Calculations used in Analytical Chemistry** **Some Important units of measurements-** SI Units, distinction between mass and weight, mole, milli mole and Numerical Problems. **Solution and their concentrations-** Concept of Molarity, molality adn normality, Expressing the concerntration in parts poer million (ppm), parts per billion (ppb), Numerical Problems. **Chemical Stoichiometry-** Empirical and Molecular Formulas, Stoichiometric Calculations, Numerical Problems. ***Keywords/Tags:*** *Accuracy, Precision, SI units, Units of Concentration, Chemical stoichiometry.*	**10**

3	**Computer for chemists** Introduction to computer, Introduction to operating systems like- DOS, Windows, Linux and Ubuntu. **Use of computer programs**	**10**

	Running of standard programs & packages such as MS-word, MS-excel, PowerPoint, Execution of linear regression x-y Plot. Use of software's for drawing structures and molecular formulae. ***Keywords/Tags:*** *Operating systems, MS-word, MS-excel, PowerPoint.*	

Text Books

1. Gaur,S., Computer for Chemists, Neel Kamal Prakashan,2017.
2. Khopkar, S.M. Basic Concept of Analytical Chemistry, New Age, Internations Publisher, 2009.
3. Kaur H, Analytical Chemistry, Pragati Prakashan(2008).
4. Gupta, Alka L., Analytical Chemistry , Pragati Prakashan (2020).
5. Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
6. Kaur H, Instrumental Methods of Chemical Analysis, Pragati Prakashan, 2018.
7. Sharma B.K., Chromatography, Krishna Prakashan,2019.
8. Sharma Y.R., Elementry Organic Spectroscopy, S Chand, 2013.
9. Singh, DR Saxena, G., Singh, B., Inorganic Chemicals, Shivlal Aggrawal & Company, Agra.
10. Srivastava, S.S., Gehlot, A.S., Chemistry, Ratan Prakashan Temple, Indore.

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PRACTICAL			
Program- CERTIFICATE	Class- B.Sc.	Year- First S1&M.	Session: 2022-23
Subject – Chemistry			
1	Course Code	S1-CHEM2P	
	Course Title	**Analytical Processes and Techniques**	

2	Course Type	Minor	
3	Course Learning Outcomes (CLO)	**By the end of this course students will learn the following aspects of Laboratory exercises in Chemistry:** 1. Concepts and analytical methods in Chemistry. 2. Preparation of solutions of different concentrations. 3. Standardization of the solution. 4. Identification of Organic compounds by chromatographic techniques. 5. Analysis by Spectral Techniques.	
4	Credit Value	2	
	Total Marks	Maximum Marks: University Exam (UE)- 60 CCE- 40	Minimum Passing Marks: 35

	External Assessment	Marks
	Experiments to be performed in laboratory	**50**
	Basic analytical exercises • Calibration of different weights and glass apparatus (measuring cylinder, burette, pipette, volumetric flasks). • Preparation of solutions of different morality/normality by weighing and dilution.	**10**

2	**Quantitative Analysis** • **Titrimetric Analysis** ◦ Standardization of NaOH with Oxalic acid. ◦ Determination of carbonate and hydroxide presentin mixture. ◦ Determination of carbonate and bicarbonate present in a mixture. ◦ Determination of free alkali present indifferent soaps/detergents.	**20**

PART A : Introduction			
Program :**Certificate**	Class: **B.Sc.**	Year : I Sem	Session: 2022-23
Subject : **Computer Science**			

1.	Course Code	S1-COSC2T
2.	Course Title	**Programming Methodology & Data Structure**
3.	Course Type (Core Course/Elective/Generic Elective/Vocational)	Minor
4.	Pre-Requisite (if any)	To study this course ,a students must have had the subject Physics/Maths in 12th class .
5.	Course Learning Outcomes(CLO)	On the Completion of this course ,learners will be able to: 1. Develop simple algorithm and flow chart to solve the problem with programming using top down design principles . 2. Writing efficient and well structured computer algorithms/programs . 3. Learn to formulate iterative solutions and array processing algorithms for problems . 4. Use the recursive technique ,pointers and searching methods in programming . 5. Will be familiar with fundamental data structure ,their implementation ; become accustomed to the description of algorithm in both functional and procedural styles . 6. Have knowledge of complexity of basic operations like insert ,delete ,search on these data structure . 7. Posses ability to choose a data structure to suitably model any data used in computer applications . 8. Design programs using various data structure including hash table ,Binary and general search Tree ,heaps ,Graphs etc. 9. Asses efficiency tradeoffs among different data structure implementations. 10. Implement and know the applications of algorithms for searching and sorting etc. 11. Know the contributions of Indian in the field of programming data structures.
6.	Credit value	**Theory-4 Credits**
7	Total Marks	Max .Marks : Min. Passing Marks

No. of Lectures (in hours per week): **2 Hours per week**		
Total No. of Lectures :**60 HRS.**		
Module	Topics	No. of Lectures
I	**Introduction to Programming** :Program concepts ,Characteristics of programming, Stages in program Development, Algorithms, Notations ,Design ,Flow chart, Types of programming Methodologies . **Inroduction to C++ Programming** :Basic Program Structure in the C++,Data types,Variable,Constatnts ,Opearators and basic I/O . **Variable:**Declaring ,defining and initializing variables, scope of variables ,using named constants ,Keywords,Casting of data types ,Opearators(Arithmetic,Logical and Bitwise),Using comments in programs,Character I/O (getc,getchr,putc,putchr etc.),Formatted and console I/O(printf(),scanf(),cin,cout),using basic header files (stdio.h,iostream.h,conio.h etc.). **Simple Expressions in C++** : (Including unary operator Eepressions,Binary operator expressions), understanding operator precedence in expressions .	8
II	**Iterativestatements :**while ,do-while and for loops,use break and continue loops,Using nested Statements (Conditional as well as Iterative). **Functions**:Top-Down design,Pre-defined functions, Programmer defined functions,local variable and global variables,Functionas with default Arguments ,Call by Value and Call by References, Parameters, Recursions. **Introduction to Arrays**: Declaration and Referring Arrays,Arrays in Memory,Initializing Array. Arrays in Functions,Multi-Dimentional Arrays.	10
III	**Structures :**Member Accessing ,Pointers to Structure ,Structureand Functions ,Array of Structure . **Unions :**Declaration and Initialization. **Strings:**Reading and Writing Strings,Arrays of Strings,Strings and Structures, Standard String and Structure, Standard String library Functions. **Searching Algorithms:**LinearSearch,Binary Search . **File Handling :**Use of Files for data input and output ,merging and copying files .	8
IV	**Data Structure** :Basic Concepts, Linear and non linear data structure	12

	Algorithm Specification –Introduction,recursivealgorithms,Data Abstraction, Performance Analysis. **Linked List**: Singly Linked List, Operations, Concatenating,Circularly linked list ,Doubly linked list –Operations. **Array:** Representation of single,Two Dimensional arrays, sparse matrices-array and linked Representation. **Stacks:**Operations array and linked implementations,applications infix to postfix conversion, postfix expression evaluation, Recursion Implementation.	

PART C: Learning Recourses

Textbooks, References Books, Other Recourses

Suggested Readings :

- Lipschutz: Schaun's outline series Data Structure ,Tata Mcgraw Hill
- Problem Solving and Program Design in C,J.R.Hanly and E.B.Koffman ,Pearson.2015
- E.Balaguruswamy,"C++TMH Publication ISBN O-07-462038-X.
- HerbertzShield,"C++ the complete References" TMH Publication.
- R.Lafore, 'Object Oriented Programming C++.
- N. Dale and C .Weems ,Programming and Problem solving with C++ :brief edition,Jones& Bartlett learnig.
- Adam Drozdek," Data structure and Algorithms in C++",Third edition Cengage Learning.
- SartajSahani, Data Structure ,Algorithms and Applications with C++ ,McGraw Hill.
- Robert L. Kruse," Data Structure and Program Design inC++',Pearson.
- D.S. Malik,Data Structure using C++,Second Edition ,Cengage Learning.
- M.A. Weiss ,Data structure and Algorithms Analysis in C,2nd edition ,Pearson.
- M.A. Weiss,Data structure and Algorithm Analysis in C,2nd edition,Pearson.

Suggested Digital Platforms ,Web links :

1. https://www.youtube.com/watch?v=BC1S40yzssA
2. https://www.youtube.com/watch?v=vLnPwxZdW4Y&vl=en
3. https://www.youtube.com/watch?v=Umm1ZQ5ltZw
4. https://www.youtube.com/watch?v=AT141CXuMKI&list=PLdo5W4Nhv31bbkJzrsKfMpogrxuLI8LU

Suggested equivalent online course

http://nptel.ac.in/courses/106/105/106105151/
http://nptel.ac.in/courses/106/106/106106133/

Program :**Certificate**	Class: **B.Sc.**	Year : **I**	Session: 2022-23

Subject : **Computer Science**

1.	Course Code	**S1-COSC2P**
2.	Course Title	**Office Tools & Programming MethodologyLab**
3.	Course Type (Core Course/Elective/Generic Elective/Vocational)	Minor
4.	Pre-Requisite (if any)	To study a student must have had the subject Physics /Maths in 12th Class
5.	Course Learning Outcomes(CLO)	**On the Completion of this course learners will be able-** 1. Develop simple algorithms and flow Chart to solve a problem with programming using top down design principles. 2. Writing efficient and well structured computer algorithms/programs. 3. Learn to Formulate iterative solutions and array processing algorithms for problems . 4. Use recursive techniques, pointers and searching methods in programming. 5. Possess ability to choose a data Structure to suitably model any data used in computer applications. 6. Implementation of algorithms for searching and sorting .
6.	Credit value	**Practical -2 Credits**
7	Total Marks	Max .Marks : 60 + 40 / Min. Passing Marks 35

PART B:Content Of the Course	
No. of Lab Practical's(in hours per week):**2Hrs. Per week**	
Total No. of Labs =30 Hours	
Suggested list of Practical's	
List of Practical **I. Office Tools .** **Using a Text Editor Tool** 1. Create a documents and apply different Editing options . 2. Create Banner for your college . 3. Design a Greeting card using word art for different festivals. 4. Design your Bio Data and use page borders and shading . 5. Create a documents and insert header and footer,apgetitle,date,time ,apply various page formatting feature etc. 6. Implement Mail Merge. 7. Insert a table into a document and try different formatting options for the table . **Using a spreadsheet Tool** 1. Design your class Time Table . 2. Prepare a Mark Sheet of your class result . 3. Prepare a salary slip of an employee of an organization. 4. Prepare a bar chart & pie chart for analysis of election result. 5. Prepare a generic Bill of a Super Market. 6. Work on the following exercise on answer book; a. Copy an existing Sheet b. Rename the old Sheet c. Insert a new Sheet into an existing Workbook d. Delete the renamed sheet. 7. Prepare an attendance sheet of 10 students for any 6 subjects of your syllabus.calculate their total attendance,total percentages of attendance of each students and average of attendance. 8. Create a worksheet of students list of any 4 facilities and perform following database function on it. a. Sort data by Name b. Filter data by Class c. Subtotal of students by class **Using a Presentation Tool**	**30 Hours**

1. Design a presentation of your institute using auto content wizard, design template and blank presentation.
2. Design a presentation illustrating insertion of pictures, Word Art and Clipart .
3. Design a presentation, learn how to save it in different formats, copying and opening an existing presentation.
4. Design a presentation illustrating insertion of movie, animation and sound.
5. Illustrate use of custom animation and slide transition (using different effects).
6. Design a presentation using charts and tables of the marks obtained in class.

Part A- Introduction			
Program: Certificate	**Class**: B.Sc. I 5sem	**Year**: 2022	**Session**: 2022-23
Subject: Mathematics			
Course Code	SI-MATH2T		
Course Title	**Calculus and Differential Equations**		
Course Type (Core/Elective/ Generic Elective/Vocational/...)	Minor		
Pre-requisite (if any)	To study this course, a student must have had the subject Mathematics in 12 class.		
Course Learning Outcomes (CLO)	The course will enable the students to: 1. Sketch curves in a plane using its Mathematical properties in the different coordinate systems of reference. 2. Using the derivatives in Optimization, Social sciences, Physics and Life sciences etc. 3. Formulate the Differential equations for various Mathematical models. 4. Using techniques to solve and analyze various Mathematical models.		
Credit Value	**6**		
Total Marks	**Max. Marks:** 60+40	**Min. Marks:** 35	

Part B- Content of the Course		
Total numbers of Lectures(in hours per week): 3 hours per week **Total Lectures:** 90 hours		
Unit	**Topics**	**Numbers of Lectures**
1	1.1 Historical background: 1.1.1 Development of Indian Mathematics ancient and early classical period (Till 500 Cen.) 1.1.2 A brief biography of Bhaskaracharya (with special reference to Lilavati and Madhava) 1.2 Successive Differentiation 1.2.1 Leibnitz Theorem 1.2.2 Maclaurin's series Expansion 1.2.3 Taylor's series Expansion	**18**
	1.3 Partial Differentiation 1.3.1 Partial Derivatives of higher order 1.3.2 Euler's theorem on homogeneous functions 1.4 Asymptotes	

	1.4.1 Asymptotes of algebraic curves 1.4.2 Condition for Existence of Asymptotes 1.4.3 Parallel Asymptotes 1.4.4 Asymptotes of polar curves	
2	2.1 Curvature ' 2.1.1 Formula for radius of Curvature 2.1.2 Curvature at origin 2.1.3 Centre of Curvature 2.2 Concavity and Convexity 2.2.1 Concavity and Convexity of curves 2.2.2 Point of inflexion 2.2.3 Singular point 2.2.4 Multiple points 2.3 Tracing of curves 2.3.1 Curves represented by Cartesian equation 2.3.2 Curves represented by Polar equation	18
	3.1 Integration of Transcendental Functions	

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

Text Books:

1. Gorakh Prasad: Differential Calculus, Pothishala Pvt. Ltd. Allahabad, 2016.
2. Gorakh Prasad: Integral Calculus, Pothishala Private Lld.. Allahabad, 2015.
3. M. D. Raisinghania: Ordinary and Partial Differential equations. S Chand & Co Ltd., 2017.
4. Gerard G. Emch, R.Sridharan and M. D. Srinivas: Contributions to the History of Indian Mathematics, Hindustan Book Agency, vol. 3, 2005.
5. Madhya Pradesh hindi granth academy books.

Reference Books:

1. N. Piskunov: Differential and Integral Calculus, CBS Publishers,1996.
2. G. F. Simmons: Differential Equations, Tata McGraw Hill, 1972.
3. E. A. Codington: An introduction to ordinary differential Equation, Prentice Hall of India, 196l.
4. D. A. Murray: Introductory Course in Differential Equations, Orient Longman (india), 1967.
5. H. T. H Piaggio: Elementary Treatise on Differential Equations and their Application, C. B.S. Publisher & Distributors Delhi, 1985.
6. Bibhutibhusan Datta and Avadhesh Narayan Singh: History of Hindu Mathematics, Asia Publishing House,1962.

Suggested Digital Platforms Web links:

https://epgp.inflibnet.ac.in

hnps://freevideolectures.com/university/iit-roorkee

https://www.highereducation.mp.gov.in/?page=xhzlQmpZwkylQo2b%2Fy5G7w%3D%3D

https://www.bhojvirtualuniversity.com

Suggested Equivalent online courses:

https://nptel.ac.in/courses/111105122/

https://nptel.ac.in/courses/1111071 12/

https://nptel.ac.in/courses/111/101/111101080/

	Part A Introduction			
Program Certificate Course		**Class: B.SC.**	**Year : FIRST** SISM	**Session : onwards** 2021-22
	Subject : Microbiology			
1	**Course Code**		**S1-MBIO2T**	
2	**Course Title**		**Microbial Techniques**	
3	**Course Type**		Minor	
4	**Pre- requisite (if any)**		To Study this course a student must have had the subject	
5	**Course Learning outcomes (CLO)**		After completing this course in Microbiology ,a student shall have understanding of- • Recall the basic lab glassware to be used in the laboratory. • Summarize different methods of sterilization and isolation of pure cultures. • Understand the working of different kinds of instruments and microscopes. • Apply serial dilution technique to isolate the bacteria. • Practice different methods to culture bacteria in the laboratory • Illustrate a method to differentiate between gram positive and gram negative bacteria.	
6	**Credit Value**		4	
7	**Total Marks**	Maximum Marks: 60+40		Minimum Passing Marks: 35

Part B- Content of the Course

Total no of Lectures –60
Lectures- Tutorials- practical (in hours per week) L-T-P:4-0-0
Total No. of Lectures: 15

Unit	Topics		No. of Lectures
I	**MICROSCOPY AND STAINING** **1.1 MICROSCOPY-** PRINCIPLES AND APPLICATION OF SIMPLE AND COMPOUND Bright- field microscopy, phase- contrast microscopy, transmission electron microscopy and scanning electron microscopy. **1.2 Preparation for light microscope Examination-** wet mount and hanging – drop techniques preparation for simmer and fixation **1.3 Staining-** principles of staining, negative staining, simple staining, differential staining (Gram and acid fast staining), flagella staining capsule and endospore staining. **Key word:**microscopy, light microscope, wet		15

	mount,Hnging drop method, Bacterial staining.		
II	**Instruments** Electronic Balance, autoclave, centrifuge ,colony counter, deep freezer, homogenizer, hot air oven,incubator,laminar air flow, magnetic stirrer, P h meter, spectrophotometer, vortex mixture, water bath, water distiller chromatography chamber anaerobic chamber and electrophoresis apparatus.		15

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Part A Introduction			
Program Certificate Course	Class: B.SC.	Year : FIRST SEM	Session : onwards 2022-23
Subject : Microbiology			

1	Course Code	S1-MBIO2P
2	Course Title	Microbial Tools and Techniques Practical
3	Course Type	Core Course
4	Pre- requisite (if any)	To Study this course a student must have had the subject
5	Course Learning outcomes (CLO)	**On completion of this course, learners will be able to understand:** • Basic Knowledge of glassware, microscopes and different kinds of instruments used in the microbiology laboratory. • Basic media preparation technique, autoclaving, cleaning and sterilization of glassware. • Preparation of liquid and solid culture media. • Isolation of microorganisms by different plating methods.
6	Credit Value	2
7	Total Marks	Maximum Marks: 60+40 / Minimum Passing Marks: 35

Part B – Content of the Course

Total No. of Lectures:30
Lectures – Tutorial – Practical (In hours per week): L-T-P: 0-0-2

S. No.	Name of the Exercise	No. of Lab Hours
1.	Demonstration and briefing about principles and working of basic instruments.	4
2.	Basic media preparation technique, autoclaving, cleaning and sterilization of glass ware.	6
3	Preparation of liquid culture media- Peptone water, nutrient broth	2
4.	Preparation of solid culture media – Nutrient agar (agar slant/ agar plate)	2
5.	Isolation of microbes from water , soil and air by serial dilution agar plating method.	3

Part A- Introduction			
Program:Certificate	**Class**:B.Sc.IYear	**Year**: 2022	**Session**: 2022-23
Subject: Physics			
Course Code	S1-PHYS2T		
. Course Title	**Mechanics and General Properties of Matter**		
Course Type (Core/Elective/ Generic Elective/Vocational/...)	Minor		
Pre-requisite (if any)	To study this course, a student must have had the subject Physics in 12" class.		
Course Learning Outcomes (CLO)	. 1. The course would empower the students to develop the idea about the behavior of physical bodies. 2. It will provide the basic concepts related to the motion of all the objects around us in daily life. 3. The students would be able to build foundation to various applied field in science and technology especially in the field of mechanical engineering. 4. The students will acquire the knowledge of basic mathematical methods to solve the various problems in physics. 5. The students will be able to understand the relativistic effect and the relation between energy and mass.		
Credit Value	60+40 4		
Total Marks	Max. Marks:	Minimum passingMarks: 33	

Part B- Content of the Course		
Total numbers of Lectures(in hours):60		
Unit	**Topics**	**Numbers of Lectures**

I	**Historical background and Mathematical Physics** 1. **Historical background:** 1.1. A brief historical background of mathematics and mechanics in the context of India and Indian culture. 1.2. A brief biography of Varahamihira and Vikram Sarabhai with their major contribution to science and society. 2. **Mathematical Physics:** 2.1. Scalar and vector fields, Gradient of a scalar field and its physical significance. 2.2. Vector integral: line integral, surface integral and volume integral, Divergence of a vector field and its physical significance, Gauss divergence theorem. 2.3. Curl of a vector field and its physical significance, Stokes and Green's theorem, Numerical problems based on the above topics. **Keywords/Tags:** Scalar field, Vector field, Vector integral, Gradient, Divergence, Curl.	12
II	**Mechanics of Rigid and deformable bodies** **1. Rigid body mechanics:** 1.1. System of particles and concept of rigid body, Torque, centre of mass: position of the centre of mass, Motion of the centre of mass, Conservation of linear & angular momentum with examples, Single stage and multistage rocket. 1.2. Rotatory motion and concept of moment of inertia, Theorems on moment of inertia: theorem of addition, theorem of perpendicular axis, theorem of parallel axis, Calculation of moment of inertia of rectangular lamina, disc, solid cylinder, solid sphere. **2. Mechanics of deformable bodies:** 2.1. Hooks law, Young's modulus, Bulk modulus, Modulus of rigidity and Poisson's ratio, Relationship between various elastic moduli. 2.2. Possible values of Poisson's ratio, Finding Poisson's ratio of rubber in the laboratory, Torsion of a cylinder, Strain energy of twisted cylinder. 2.3. Finding the modulus of rigidity of the material of a wire by Barton's method, Torsional pendulum and Maxwell's needle, Searl'smethod to find Y, η and σ of the material of a wire, Bending of beam, Cantilever, Beam supported at its ends and loaded in the middle. **Keywords/Tags:** Rigid body, Centre of mass, Moment of Inertia, Poisson's ratio.	12

III	**Fluid mechanics** **1. Surface Tension:** 1.1. Inter-molecular forces and potential energy curve, force of cohesion and adhesion. 1.2. Surface tension, Explanation of surface tension on the basis of intermolecular forces, Surface energy, Effect of temperature and Impurities on surface tension, Dally life application of surface tension. 1.3. Angle of contact, The pressure difference between the two sided of a curved liquid surface, Excess pressure inside a soap bubble, Capillarity, determination of surface tension of a liquid capillary rise method, Jaeger's method. **2. Viscosity:** 2.1. Ideal and viscous fluid, Streamline and turbulent flow, Equation of continuity, Rotational and Irrational flow, Energy of a flowing fluid, Euler's equation of motion of a non-viscous fluid and its physical significance. 2.2. Bernoulli's theorem and its applications (Velocity of efflux, shapes of wings of airplane, Magnus effect, Filter pump, Bunsen's burner) 2.3. Viscous flow of a fluid, Flow of liquid through a capillary tube, Derivation of Polseuille's formula and limitations, Stocks formula, Motion of a spherical body falling In a viscous fluid. **Keywords/Tags:** Inter-molecular force, Surface tension, Angle of contact, Capillarity, Viscosity, Euler's equation, Polseulle's formula	12

Part A- Introduction			
Program: Certificate	**Class:** B.Sc. I Year	**Year:** 2021	**Session:** 2022–23
Subject: Physics			
Course Code	**S1-PHYS2P**		
Course Title	**Mechanics and General Properties of Matter Lab**		
Course Type Core/Elective/ Generic Elective/Vocational/...	Minor		
Pre-requisite (if any	To study this course, a student must have had the subject Physics in 12" class.		
Course Learning	1. The students would acquire basic		

Outcomes (CLO)	practicalknowledge related to mechanics through theexperiments. 2. Students will be familiar with variousmeasurement devices by which they can measurevarious physical quantities with accuracy. 3. The students will develop the concept related tothe mechanics and properties of matter.	
Credit Value	2	
Total Marks	Max. Marks 60 + 40	Min passing Marks :33

Part B- Content of the Course

Total numbers of Lectures(in hours):60

Sr.No	List of experiments	Number of Practical (in hours)
1	Determination of Young's modulus, modulus of rigidity andPoisson's ratio of material of a wire using Searle's method.	30
2	Determination of Young's modulus of material of a metallic barby bending of beam method.	
3	Determination of acceleration due to gravity (g) using Bar pendulum.	
4	Determination of acceleration due to gravity (g) using Kater'sreversible pendulum.	
5	Determination of modulus of rigidity of a rod with the help ofBarton's apparatus.	
6	Determination of coefficient of viscosity of liquid usingPoiseuille's method.	
7	Determination of the moment of inertia of a flywheel about its axisof rotation	
8	Determination of the moment of inertia of a given body (irregularbody) with the help of inertia table.	

	Part A Introduction			
Program Certificate Course		**Class: B.SC.**	**Year : FIRST** S1 S2	**Session : ____ onwards** 2022-23
	Subject : ZOOLOGY			
1	**Course Code**		**S1-ZOOL2T**	
2	**Course Title**		**Cell biology, reproductive biology and developmental biology**	
3	**Course Type**		Minor	
4	**Pre- requisite (if any)**		To study this course a student must have had the subject Biology in class 12th.	
5	**Course Learning outcomes (CLO)**		After completing this course in ZOOLOGY, a student shall have understanding of. • Develop deeper understanding of what life is and how it functions at cellular level. • Understand the nature and basic concepts of cell biology, Reproductive and Developmental biology. • Understand structure and functions of cell membrane, and cellular organelles. • Understand the importance of latest reproductive trends, reproductive techniques to be applied for human welfare. • Understand the general patterns and sequential developmental stages during embryogenesis;& understand how the developmental processes lead to establishment of body plan of multicellular organisms. • Understand the the evolutionary development of various animals.	
6	**Credit Value**		4	
7	**Total Marks**	Maximum Marks: 60 + 40	Minimum Passing Marks: 35	
	Part B- Content of the Course			
	Total no of Lectures –60 organisms **Lectures- Tutorials- practical (in hours per week) L-T-P:4-0-0**			
Unit	**Topics**			**No. of Lectures**

I	**Cell biology:** **1.1** Concept of prokaryotic and eukaryotic cell, difference between prokaryotic and eukaryotic cells. **1.2** Structure and functions of plasma membrane **1.3** Structure and functions of Golgi body, Mitochondria, Endoplasmic reticulum, ribosomes and lysosomes. **1.4** Structure and functions of Nucleus. **1.5** Structure and functions of Chromosomes and special types of chromosomes- Lamp brush and Polygenes chromosomes. **1.6** Cell cycle, Mitotic & Meiotic cell division and their significance. **Keywords:** Prokaryote, Eukaryote, cell organelles, chromosomes, cell cycle.	13
II	2. **Reproductive Biology:** **1.1** Structure of Male reproductive system of Lupus. **1.2** Structure of Female reproductive system of Lupus. **1.3** Histology of testis, and Ovary of Lupus. 1.4 Gametogenesis- Spermatogenesis and oogenesis, difference between spermatogenesis and oogenesis. 1.5 Types of Eggs- based on amount and distribution of yolk with examples. **Keywords**: Reproductive system, Gametogenesis, sperms, eggs.	13
III	**Recent assisted Reproductive Techniques (ART):** **3.1** Stem cell- Types and their uses. **3.2** Gene bank, sperm bank, superovulation, cryopreservation. **3.3** In Vitro Fertilization (IVF) and Embryo Transfer (ET), Zygote. **3.4** Placentation- Types, examples and functions. **3.5 Placenta** Banking- placenta preservation benefits. **Key words:** Gene bank, sperm bank, superovulation, IVF, ET.	15
IV	**4. Developmental Biology:**	11

Part A Introduction

PRACTICAL SYLLABUS

Program Certificate Course	Class: B.SC.	Year : FIRST sem	Session : 2022-23 onwards

Subject: ZOOLOGY

1	Course Code	S1-ZOOL2P
2	Course Title	CYTOLOGY, REPRODUCTIVE BIOLOGY & EMBROLOGY (Paper2)
3	Course Type	Minor
4	Pre- requisite (if any)	To Study this course a student must have had the subject
5	Course Learning outcomes (CLO)	**On completion of this course, learners will be able to understand:** • The different stages of mitotic and meiotic cell division and special types of chromosomes. • Different stages of embryology. • Through squash preparations understand the stage of cell division and structure of polygene chromosomes. • Enhance collaborative learning and communication skills through practical sessions, team work group discussion assignments & projects.
6	Credit Value	2
7	Total Marks	Maximum Marks: 60 + 40 / Minimum Passing Marks: 35

Part B – Content of the Course

Total No. of Lectures:30

Lectures – Tutorial – Practical (In hours per week): L-T-P: 0-0-2

Unit	TOPICS	No. of Lab Hours
1.	Spotting related to the cytology a. Prokaryotes and Eukaryotes cell b. Stages of mitotic cell division c. Stages of meiotic cell division d. Lamp brush chromosomes.	13

2.	Spotting related to Reproductive biology & Embryology a. T.S. Testis of Mammal b. T.S. Ovary of Mammal c. Development stages of frog Embryology d. Developmental stages of Chick embryology.	13
3	Squash preparation of onion root tip to understand the stages ofMitotis	8
4	Squash preparation of Grasshopper testis to understand the stage of	9