# **Department of Computer Science**

# **Bachelor of Science (Biotechnology)**

# **B.Sc. (BT)**

# CURRICULA

# Shri Vaishnav Institute of Management, Indore

Approved by AICTE, New Delhi and Affiliated to DAVV, Indore & RGPV Bhopal

UGC NAAC 'A' Grade Institute

Scheme No. 71, Gumasta Nagar, Indore

#### Department of Higher Education, Government of Madhya PradeshYearly Syllabus for Undergraduates As recommended by Central Board of Studies of Computer Science andApproved by H E the Governor of M. P. (As per NEP 2020) Session 2021-22

# B.Sc. I Year Biotechnology Subject: Biotechnology (Major)

Part A: Introduction					
Program	Certificate	Class: B.Sc.	First Year	Session 2021-22	
		Subject: Biot	echnology		
1.	Course Code	CORE TH-1-S	SI-BTEC1T		
2.	<b>Course Title</b>	Cell Biology an	nd Biochemist	ry (Paper I)	
3.	<b>Course Type</b>	Core Course			
4.	Pre-requisition	To study this co in $12^{\text{th}}$ class.	ourse, a studen	t must have had the subject Biology	
5.	Course	Course Object	tive: -The Mai	n Objective of the course will be to	
	Learning	build the found	ation for study	ing Biotechnology. The Demand for	
	Outcomes	I rained work	force in Bio	Industry Sector Academic and	
		Research Secto to foster The restructure and Biological The curriculum its applications research Learning Outco able to: 1. Underst 2. Apprecia arrangen stability 3. Underst of biom	<ul> <li>Fundamental Research and Industry Sector. Academic and Research Sectors also Require Interdisciplinary trained manpower to foster the Biotechnology Revolution. The restructured syllabus combines basic principles of Chemical and Biological sciences considering advancements in technology. The curriculum aims to impart basic knowledge with emphasis on its applications to make the students ready for industries and research work in concerned field. Learning Outcome: -At the end of the paper, a student should be able to: <ol> <li>Understand basics of cell biology.</li> </ol> </li> <li>Appreciate the importance of bonding and spatial arrangements of molecules for proper functioning and stability.</li> <li>Understand both the physical as well as chemical properties</li> </ul>		
		The dec biomole	crease of incre cules can have	ease in the amount of some of the clinical significance.	

6. Credit Value	pathological labo Theory- 4	oratories.
6. Credit Value	Theory- 4	Mir. Dessine Marka 22

	Part B- Content of the Course				
Total No	. of Lectures (in hours per week): 2 hours per week				
Total Lee	ctures: 60 hours				
Unit	Topics	No. of			
		Lectures			
1	Cell as a Basic Unit:	12			
	1. Historical background of the Cell				
	1.1.History of Cell Biology.				
	1.2.Cell Structure.				
	1.3.Cell Theory.				
	2. Prokaryotic Cell and Cell Organelles:				
	2.1.Ultrastructure of Prokaryotic Cell.				
	2.2.Structure and function of cell organelles: Flagella, Pili, Cell				
	wall, Cytoplasmic membrane, nuclear region, Ribosomes,				
	Vacuoles, Metachromatic granules, Spores and Cysts,				
	Microtubules, Microfilaments, Centriole.				
	2.3.Difference between Prokaryotic and Eukaryotic cells.				
	Key Words: Cell theory, Prokaryotic Cell				
II	Cell Organelles and Cell Cycle:	12			
	1. Eukaryotic Cell and Cell Organelles:				
	1.1. Ultrastructure of Eukaryotic cell (Plant and Animal cells).				
	1.2. Structure and function of cell organelles: Cell membrane,				
	Mitochondria, Chloroplast, Endoplasmic reticulum, Golgi				
	bodies, Lysosomes, Peroxisomes, Nucleus.				
	2. Cell Cycle:				
	2.1.Cell cycle and Cell division.				
	2.2.Apoptosis or Cell death				
	Key Words- Eukaryotic cell, cell organelles, Cell cycle, Apoptosis				

III	Molecular Structure of Water:	12
	1. Water structure and Buffer:	
	1.1.Properties of Water.	
	1.2.Interaction of Water.	
	1.3.Role of Water in Bio molecular Structure.	
	1.4. Acid and Bases, Buffer solutions.	
	2. Chemical Bonds:	
	2.1 Chemical Bonds (Ionic Bond, Covalent Bond,	
	Coordinate Bond, Non-Covalent Bonds, Hydrogen Bond)	
	Keywords- Water, Buffer, Chemical Bonds	
2.	Eukaryotic Microorganisms	12
	3.1. Basic knowledge of Eukaryotic organisms and their	
	evolutionary	
	pattern.	
	3.2. Fungi - Study of Saccharomyces cerevisiae, Mucor,	
	Aspergillus, Rhizopus and Penicillium.	
	3.3. Protozoa - Study of Euglena, Trypanosoma, Leishmania,	
	Amoeba, Entamoeba, and Plasmodium.	
	Key words: Eukaryotes, Fungi, Protozoa	
3.	Biomolecules:	12
	Sources, Nomenclature, Classification, Structures, Characteristics, and	
	Functions:	
	1. Carbohydrates,	
	2. Lipids, 3. Protoins and Nucleic Acids	
	S. Flotens and Nucleic Acids. Key Words: - Carbohydrates Proteins Lipids Nucleic Acids	
4		
4.	Tools and Techniques	
	1.1.Principle and Applications of Light Microscopy,	
	Centrifugation, Chromatography (Paper, Thin layer, and	
	Column). Colorimeter and Spectrophotometer.	
	Key Words: Microscope, Chromatography, Spectrophotometer	

#### Part C- Learning Resources Textbooks, Reference Books and Other Resources

#### **Suggested Readings:**

- 1. Industrial Biotechnology B.D. Singh.
- 2. Textbook of Biochemistry -S.P. Singh.
- 3. Cell and Molecular Biology P.K. Gupta.
- 4. Cell Biology P.S. Verma and Agrawal
- 5. Cell and Molecular Biology. S.C.Rastogy.
- 6. Cell Biology. P.S. Verma and Agrawal

#### Suggested equivalent online courses:

- 1. https://pubs.acs.org/loi/bichaw (for Biochemistry).
- 2. https://pubs.acs.org/loi/bipret, https://guides.lib.uh.edu/biotech (for biotechnology).
- 3. http://www.freebookcentre.net/Biology/BioTechnology-Books.htmle books on biotechnology.
- 4. https://www.phindia.com/Books/ShoweBooks/MTENA/Biotechnologye books on biotechnology.
- 5. https://bookauthority.org/books/best-biotechnology-ebookse books on biotechnology.

Part D- Assessment and Evaluation					
Maximum Marks: 100					
Continuous Comprehensive Ev	valuation (CCE): 25				
University Exam (UE):	75				
Time: 02 Hours					
Internal Assessment	Class Test	15			
Continuous Comprehensive	Assignment/Presentation	10			
Evaluation (CCE):	Total	25			
External Assessment:	Section (A): Three Very Short	3×3=9			
University Exam	Questions (50 Words Each)				
	Section (B): Four Short	4×9=36			
	Questions (200 Words Each)				
	Section (C): Two Long	2×15=30			
	Ouestions (500 Words Each)				
	Total	75			
	1 otal				
Any remarks/suggestions: Ni	1				

	Part A- Introduction					
Program Certificate		Class:	First Year	Session 2021-22		
		B.Sc.				
Subject: Biotechnology						
1.	<b>Course Code</b>	CORE-PR-1	-SI-BTE C1F	)		

2.	<b>Course Title</b>	Lab work for cell Biology and Biochemistry (Paper 1)			
3.	Course Type	Core Course			
4.	Pre-requisition	To study this course a student must have had the subject Biology in class 12 <sup>th</sup> .			
5.	Course Learning Outcomes (CLO)	<ul> <li>Course Objective: -The Main Objective of the course will</li> <li>be to give hands-on practical knowledge in Biotechnology.</li> <li>The Demand for Trained workforce in Biotechnology is</li> <li>ever growing in Fundamental Research and Industry Sector.</li> <li>Academic and Research Sectors also Require</li> <li>Interdisciplinary trained manpower to foster the</li> <li>Biotechnology Revolution. The curriculum aims to impart</li> <li>basic knowledge with emphasis on its applications to make</li> <li>the students ready for industries and research work in</li> <li>concerned field.</li> <li>Learning Outcome: -At the end of the paper, a student will</li> <li>be able to:</li> <li>1. Understand basic techniques of cell biology.</li> <li>2. Know the physical as well as chemical properties of</li> <li>biomolecules.</li> <li>3. Pursue a career in biochemical testing. The decrease of</li> <li>increase in the amount of some of the biomolecules can</li> <li>have clinical significance.</li> <li>4. Take medical Laboratory Technique Courses, opening</li> <li>opportunities in hospitals and pathological laboratories.</li> </ul>			
6.	Credit Value	2			
7.	Total Marks	Max. Marks: 25+75 Min. Passing Marks: 33			

Part B- Content of Practical Course				
Total No. of Lectures (in hours per week): 2 hours per we	eek			
Credits 2 (Practical: 30 hours)				
Scheme of Practical Examination: -	Max. Marks (25 + 75 =			
100)				
(A) Internal Assessment.	Max. Marks- 25			
1. Class interaction	05			
2. Quiz	05			
3. Seminar	07			
4. Assignments (charts, rural service, Technology	Dissemination/Excursion/ Lab visit/			
Industrial Training)	08			
(B) External Assessment: -	Max. Marks- 75			
1. Major experiment	15			
2. Minor experiment-1	10			
3. Minor experiment-2	10			

4.	Spotting	15
5.	Viva-Voce	15
6.	Practical record	10
List of	f Experiments/ Exercise	
1.	To study the plant cell structure using various plant materials.	
2.	To study the animal cell structure using cheek cells.	
3.	To Prepare Onion root tip for the stages of Mitosis.	
4.	To Prepare and study the different stages of Mitosis and Meiosis.	
5.	To analyze Carbohydrates Quantitatively.	
6.	To analyze proteins Quantitatively.	
7.	To analyze lipids Quantitatively.	
8.	To Prepare Buffers.	
9.	To Separate plant pigments by Paper Chromatography.	
10		

10. To Separate amino acids by TLC.

	Part A- Introduction				
Program	Certificate	Class:	First Year	Session 2021-22	
		B.Sc.			
		Subject: B	iotechnology		
1.	Course Code	CORE-TH	-2SIBTEC2T		
2.	<b>Course Title</b>	Microbiolo	gy and immun	ology (Paper II)	
3.	Course Type	Core Cours	e		
4.	Pre-requisition	To study the	is course a stud	ent must have had the subject	
		Biology in a	class 12 <sup>th</sup> .	_	
5.	Course	Course Ob	jectives: To cre	eate general understanding about	
	Learning	microbiolog	gy and immuno	logy	
	Outcomes				
	(CLO)	1. The	students will be	e able to understand microbial	
		dive	rsity and Nutrit	ion.	
		2. The students will be able to understand immune			
		system, Immune responses, and Vaccination.			
		3. The	students will be	e able to describe role of immune	
		syste dise	em in both main ase.	ntaining health and contributing to	
		4. The tech	students will be niques.	e able to understand immunological	
		<b>Course Lea</b>	rning Outcom	es: At the end of the course student	
		will be fami	iliar with –		
		1. Mic	robial diversity	and nutrition.	
		2. Imm	nune system, its	properties, and types.	
		3. Imm	unoglobulin str	ructure, types and functions and can	
		appl	y the concept o	f hypersensitivity and vaccination	
		for c	lifferent disease	es.	
		4. Perf	orm various im	munological techniques.	

6.	Credit Value	4	
7.	Total Marks	Max. Marks: 25+75	Min. Passing Marks: <b>33</b>

Part B- Content of the Course				
Total No	. of Lectures- 60			
Unit	Topics	No. of		
		Lectures		
Ι	History, Basic concepts of Microbiology and Culture Media	12		
	preparation			
	1. History, Basic concepts of Microbiology:			
	1.1.Fundamental, History and evolution of microbiology,			
	Development of microbiology, Application of microbiology			
	ni human welfare.			
	1.2. Classification, General characteristic and structure of			
	Bacteria, Fungi and Viruses.			
	2. Media Preparation:			
	2.1. Methods and Types: Culture, Minimal, Selective,			
	differential, Transport media.			
	2.2. Synchronous, Batch and Continuous culture			
	<b>Key Words</b> : Classification of Microorganisms, Media Preparation.			
Π	Microbial Growth and Growth measurement:	14		
11	1 Microbial Growth	17		
	1.1 Definition of growth Mathematical expression of growth Curve			
	Generation time. Growth yield. Effect of nutrients on growth.			
	1.2. Factor affecting growth: Nutrient, Temperature, Oxygen, pH.			
	Osmotic pressure.			
	2. Growth measurement:			
	2.1 Measurement of Growth (Direct and Indirect methods): cell number,			
	Cell Mass, and Cell Activity.			
	2.2. Cell Count: Turbidometric method, Plate count method, Membrane			
	count method, Dry weight, and Wet method by measurement of cellular			
	activity.			
	Key Words: Growth, Measurement.			
III	Basics of Immunology:	10		
	1.1.Concept of Innate and Acquired immunity, Phygocytosis			
	complement and Inflammatory responses.			
	1.2. Immune cells and organs: Structure, Function and Properties of			
	immune cells - Stem cell, T-cell, B-cell,			
	NK-cell, Macrophagus, Neutrophil, Eosinophil, Basophil,			
	Mastcell, Dentric cell.			
	1.3. Immune organs: Bone marrow, Thymus, Lymph Node, Spleen,			
	lymphatic system.			
	Key words: Immunity, Immune cells.			

IV	Immunoglobulins and Immune response:	15
	1. Immunoglobulins	
	1.1. Antigens: Characteristics of an antigen: Foreignness,	
	Molecular size, Chemical composition and	
	Heterogeneity, Antigen Adjuvants, Epitopes, Haptens.	
	1.2. Antibodies: Structure, Types, Functions and Properties	
	of antibodies Antigenic determinant on antibodies	
	(Isotypic, Allotypic, Idiotypic). Monoclonal, Polyclonal	
	and Chimeric antibody.	
	2. Immune response:	
	Generation of immune response: Primary and Secondary immune	
	response, generation of Humoral response (Plasma and Memory	
	cell), Generation of cell mediated immune response (self MHC	
	restriction, T-cell activation, Co-stimulatory signals), Killing	
	Mechanisms by CTL and NK cells, Introduction to tolerance.	
	Key Words: Antigens, Antibody.	
V	Microbial, Immunological Techniques and Vaccination:	10
	1. Microbial Techniques:	
	1.1. Principle, Working and applications of instruments -Laminar airflow, Autoclave, Hot air oven.	
	2. Immunological techniques:	
	2.1.RIA, ELISA, Western blotting, Principles of Precipitation,	
	Agglutination, Immunodiffusion, Immunoelectrophorosis.	
	3. Vaccination:	
	3.1. Vaccines and vaccination: Rubella, Varicella (Chickenpox),	
	Pono, Diptheria, Hepatitis vaccine.	
	Key Words: RIA, ELISA, Laminar air flow, Autoclave, Vaccine.	

	Part C- Learning Resources
	Textbooks, Reference Books and Other Resources
Sugge	sted Readings:
1.	Fundamentals of microbiology and immunology; A.K.Baneriee and Nirmalava
	Banerjee, New Central Book Agency, New Delhi.
2.	Modern concepts of microbiology; H.D. Kumar and Swati Kumar., Vikas Publishing
	House Pvt Ltd., 2nd Edition.
3.	Microbiology; M.J. Pelezar, E.C.S. Chan and N.R.Krieg, McGraw Hil Book company.
	1993, 5 editions.
4.	A text book of microbiology; R.C.Dubey and D.K.Maheshwari . S Chand and
	Company Ltd 2004, I" edition.
5.	Microbiology; P.D.Sharma, Rastogi Publication, Meerut.
6.	General Microbiology Vol I and I; C.B. Powar and H.F.Dagniwala, Himalaya
	Publication.
7.	Microbiology Fundamental and Applications; S.S.Purohit, Agrobias, 7' Edition.
8.	Immunology; K.R. Joshi, Agrobios, 5 <sup>th</sup> edition.
Sugge	sted Equivalent online courses:
1.	http://www.freebookcentre.net > free microbiology books download books online
	Textbooks.
2.	http://open.oregonstate.education>General Microbiology- Open Textbook-Open
	Textbooks.
3.	http://www.freebookcentre.net>Immune System and Immunology (PDF63P)
	download book.
4.	http://hmmcollege.ac.in>3PDF Introduction to Immunology.
5.	http://www.malecentrum.sk>PDF IMMUNOLOGY &MICROBIOLOGY

Pa	art D- Assessment and Evaluation	n
Suggested Continuous Evaluation	ation Methods:	
Maximum Marks:	100	
Continuous Comprehensive Ex	valuation (CCE): 25	
University Exam (UE):	75	
Internal Assessment	Class Test	15
Continuous Comprehensive	Assignment/Presentation	10
Evaluation (CCE): 25	Total	25
External Assessment:	Section (A): Three Very Short	3×3=9
University Exam Section: 75	Questions (50 Words Each)	
Time: 02:00 Hours	Section (B): Four Short	4×9=36
	Questions (200 Words Each)	
	Section (C): Two Long	2×15=30
	Questions (500 Words Each)	
	Total	75
Any remarks/suggestions: Ni	1	

Part A- Introduction						
Program	Certificate	Class:	First Y	ear	Session 2021-22	
	B.Sc.					
	Subject: Biotechnology					
1.	Course Code	CORE-PR-2	-SI-BTF	C2P		
2.	Course Title	Lab on Micro	biology	and I	mmunology	
3.	Course Type	Core Course				
4.	<b>Pre-requisition</b>	To study this Biology in cla	course a ass $12^{\text{th}}$ .	stude	ent must have had the subject	
5.	Course	The objective	e of the o	cours	e is to prepare students competent	
	Learning Outcomes (CLO)	in subject thro 1. The model 2. The mice praceline acce Course Lear On completion sufficient scieline immunology-	<ul> <li>in subjective of the course is to prophe students competent in subject through in-depth lecture and laboratory practices-</li> <li>1. The students will be able to identify microbes using modern techniques.</li> <li>2. The students will acquire skill and competence in microbiological and immunological laboratory practices applicable to microbiological research or clinical methods of immunology, including accurately reporting observations and analysis.</li> <li>Course Learning Outcomes:</li> <li>On completion of this course, learners will be able to have sufficient scientific understanding of microbiology and immunology-</li> </ul>			
		<ol> <li>Stude sterili experi</li> <li>Stude antise to-day</li> <li>Stude of inst oven of</li> </ol>	nts can a zation m iments. ents can a ptic. disi / life. nts will a truments etc.	pply o ethod apply nfecto apply - Lar	concept, principle and types of s viz performing microbiological the concept and characteristics of ed and their mode of action in day- principle, working and applications ninar airflow, Autoclave, Hot air	
6.	Credit Value	2				
7.	Total Marks	Max. Marks:	25+75	l	Min. Passing Marks: <b>33</b>	

Part B- Content of Practical Course		
Total No. of Practical (In Hours)- 30		
Topics	Hours	
List of Practical Total 30		

1. To perform Aseptic technique, Cleaning of glassware's,	
preparation of Cotton Plugging and Sterilization.	
2. To prepare Bacterial and Fungal media.	
3. To isolate microbes from Air, Water and Soil.	
4. To Study dilution and plating by Pour Plate, Spread Plate	
methods.	
5. To Study microorganisms by Staining method - Simple	
staining, Gram staining, Endospore staining, Fungal	
staining, Negative staining	
6. To identify bacteria based on staining, Shape and Size.	
7. To enumerate microorganism - To t a l and Viable count.	
8. To study Antibiotic sensitivity of microbes by the use of	
antibiotic discs.	
9. To isolate and identify pathogenic bacteria from sewage	
and wastewater.	
10. To Determine growth curve and generation time of E. coli.	
11. To identify human blood groups.	
12. To enumerate total WBC of the given blood sample by	
hemocytometer.	
13. To enumerate the differential Leukocyte of the given blood	
sample.	
14. To enumerate total RBC of the given blood sample by	
hemocytometer.	
15. To isolate and Identify aquatic Fungi from Local	
waterbody.	

#### **Part C- Learning**

#### Resources

#### Textbooks, Reference Books and OtherResources

Suggested Readings –

- 1. Laboratory Techniques in Modern Biology; N. Swarup. SC. Pathak, S. Arora, Kalyani Publication, New Delhi.
- 2. Integrated Methodologies in Biology; Shashi Shrivastava. Banerjee, Arun Prakashan, Gwalior.
- 3. Experiment in Microbiology Plant Pathology and Biotechnology; K. R. Anejaa, New Age International, New Delhi, 2007.
- 4. Laboratory Manual of Biotechnology; P. N. Swamy, Rastogi Publication, Meerut.
- 5. Practical Microbiology; R. C. Dubey, D. K. Maheshwari, S Chand & Company, Delhi.
- 6. Manual of Experiments in Biotechnology: Leena Lakhani, Sheeba Khan, Kailash Pustak Sadan, Bhopal.

#### Suggested digital platforms web links

http://lipguides.uphsc.edu>.....ebooks Microbiology Immunology &Biochemistry. http://bookauthority.org>..Microbiology eBook

Part	t D- Assessmer	nt and Evaluation			
ggested Continuous Evaluation Methods:					
Internal Assessment	Marks	External Assessment	Marks		
Class Interaction/Quiz	10	Viva voce on Practical	15		
Attendance	5	Practical Record File	10		
Assignments (Charts/Model/Seminar/Rural Service/Technology Dissemination/Report of Excursion/Lab Visits/ Survey/ Industrial Visit)	10	Table work/Experiments	50		
Total	25		75		
Any remarks/ Suggestions: Nil Scheme of table work/Experimen	ts				
1. Major Experiment		15			
2. Minor Experiment-1		10			
3. Minor Experiment-2		10			
4. Spotting		15			
5. Viva-Voce		15			
6. Practical Record		10			

#### Department of Higher Education, Government of Madhya PradeshYearly Syllabus for Undergraduates As recommended by Central Board of Studies of Computer Science andApproved by H E the Governor of M. P. (As per NEP 2020) Session 2021-22

	Subject: Chemistry (Minor/Elective)					
Program Certificate		Class: B.Sc.	First Year	Session 2021-22		
		Subject: Ch	emistry			
1.	Course Code	e S1-CHEM2T				
2.	<b>Course Title</b>	Analytical Chemistry (Paper II)				
3.	Course Type	Core Course	Core Course			
4.	Pre-requisition	To study this course a student must have had the subject Chemistry in class 12 <sup>th</sup> or equivalent				
5.	Course	By the end of this course students will learn the following				
	Learning	aspects of Chemistry:				
	Outcomes	1. Basic	concepts of M	Iathematics for Chemists.		
	(CLO)	2. Fundamentals of Analytical Chemistry and steps				

# B.Sc. I Year Biotechnology Subject: Chemistry (Minor/Elective)

		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.		
6.	Credit Value	4		
7.	Total Marks	Maximum Marks: CCE-	Min. Passing Marks:33	
		25,		
		University Exam (UE)-75		

	Part B- Content of the Course	
Total No	. of Lectures-Tutorials-Practical (In hours per week):	
L-T-P:	90-0-30	
Unit	Topics	No. of
		Lectures
1.	Mathematics for Chemists	10
	Straight line equation, Logarithmic relations, Curve sketching, Linear	
	graphs & calculation of slopes, Differentiation, differentiation of	
	functions like $K_X$ , $e^x$ , $x^n$ , sin x, log x, maxima & minima, partial	
	differentiation, Integration of some useful relevant functions.	
	Keywords/Tags: Linear graphs, Logarithmic Relation, Differentiation,	
	Integration.	
2.	Basic Analytical Chemistry: Introduction to Analytical Chemistry and	10
	its interdisciplinary nature. Concept of sampling. Importance of accuracy,	
	precision, and sources of error in analytical measurements. 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, and normality. Expressing the concentration in parts per	
	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.	

3.	Computer for Chemists	10
	Introduction to computer, Introduction to operating systems like -DOS,	
	Windows, Linux, and Ubuntu.	
	Use of computer programs	
	Running of standard programs & packages such as MS-word, MS-excel,	
	PowerPoint, Execution of linear regression x-y Plot. Use of software	
	for drawing structures and molecular formulae.	
	Keywords/Tags: Operating Systems, MS-word, MS-excel, PowerPoint.	
4.	Chemical Equilibrium: Equilibrium constant and free energy,	10
	concept of chemical potential, Thermodynamic derivation of law of	
	chemical equilibrium. Temperature dependence of equilibrium	
	constant; Van't Hoff reaction isochore, Van't Hoff reaction	
	isotherm. Le-Chatelier's principle and its applications.	
	Konwords/Togge Chamical Equilibrium Equilibrium constant	
	Reywords/ Tags: Chemical Equilibrium, Equilibrium constant,	
	Free Energy. Chemical Potential	
5.	Chromatography	10
	Introduction, Principle and Classification. Mechanism of	
	separation: adsorption, partition & ion-exchange.	
	Development of chromatograms: frontal. elution and displacement	
	methods. Paper Chromatography. (Ascending, descending and	
	circular). Thin Laver Chromatography (TLC) and Column	
	Chromatography (CC) Gas Chromatography (GC) and High-	
	Pressure Liquid Chrometography (HPLC), types of columns and	
	achieve aclostice annihilations annihilations	
	column selection, applications, initiations.	
	Principle and Applications of:	
	Flash chromatography.	
	<ul> <li>Ion-exchange chromatography and</li> </ul>	
	Chiral chromatography.	
	Keywords/Tags: Chromatogram, Ion Exchange, Column	
	Selection, Adsorption	
6.	Spectral techniques of analysis	10
	1	-
	Basics of absorption spectroscopy: Electromagnetic radiation, Spectral	
	range. Absorbance, Absorptivity, Molar Absorptivity, Fundamental Laws	
	of Absorption, Lambert-Beer Law, and its limitations.	
	Constitution & working of photometer, spectrometer, colorimeter.	
	Ultraviolet (UV) absorption spectroscopy-	
	Presentation and analysis of UV spectra, Types of electronic transitions,	
	Effect of conjugation. Concept of chromophore and auxochrome.	
	Bathochromic, hypsochromic, Hyperchromic and hypochromic shifts. UV	
	spectra of conjugated polyenes and enones.	

**Infra-red (IR) absorption spectroscopy-**Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, Measurement of RI spectrum, fingerprint region, characteristic absorption of various functional groups and interpretation of RI spectra of simple organic compounds. **Keywords/Tags:** *Hypsochromic, Hypochromic, Absorption, Spectrum.* 

### Part C- Learning

#### Resources Textbooks, Reference Books and Other Resources

#### Textbooks-

- 1. Gaur, S., Computer for Chemists, Neel Kamal Prakashan, 2017.
- 2. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age, International 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, PragatiPrakashan, 2018.
- 7. Sharma B.K., Chromatography. Krishna Prakashan, 2019.
- 8. Sharma Y.R., Elementary Organic Spectroscopy, S Chand, 2013.
- 9. Singh, DR, Saxena, G., Singh, B., Inorganic Chemicals, Shivlal Aggarwal & Company, Agra.
- 10. Srivastava, S. S., Gehlot, A. S., Chemistry, Ratan Prakashan Temple, Indore
- 11. Soni, PL, Organic Chemistry, Sultan Chand and Sons, Delhi.
- 12. Singh, RK. P., Modern Chemistry, Sahitya Bhavan, Agra.
- 13. Agnihotri, PK, Sahu, D.
- 14. P., Pillai, A., Sahu, M., Yugbodh Chemistry, Yugbodh Publications, Raipur

Reference Books:

- 1. Mitra Surbhi, Handbook of Computer Science & IT, Arihant, 2018.
- 2. Harris, D. C. Quantitative Chemical Analysis. 6th Ed., Freeman (2007).
- 3. Christian, Gary D; Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.
- 4. Barrow, GM. Physical Chemistry. Tata McGraw-Hill (2007).
- 5. Atkins' Physical Chemistry, 10' Edition, Oxford University Press, 2014.
- 6. Guru J.N, Gurtu A, Advanced Physical Chemistry, Pragati Prakashan, Meerut. ISBN: 9789386633347, 9386633345; Edition: IV, 2017.
- 7. Atkins, P.W. & Paula, J. Physical Chemistry, Oxford Press, 2006.
- 8. Finar, IL., Organic Chemistry (Vol. I&1I), E.L.B.S.
- 9. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
- 10. Banwell, Molecular Spectroscopy, 2017.
- 11. Silverstien Robert, Spectrometric Identification of Organic Compounds, Wiley, 2014.
- 12. Dyer J.R., Applications of Absorption Spectroscopy of Organic Compounds. 2009.

## Suggested equivalent online courses:

MOOC: https://www.edx.org/course/basic-analytical-chemistry NPTEL: https://nptel.ac.in/courses/104/105/104105084/

#### Web sources

- 1. http://www.freebookcentre.net/Chemistry/Analvtical-Chemistry-Books.html.
- 2. https://www.springer.com/journal/216

Part D- Assessment and Evaluation	
<b>Suggested Continuous Evaluation Methods:</b> Continuous Internal Evaluation shall be based on Allotted Assignment and Class Tests. The marks shall be as follows:	Marks
Assessment and presentation of assignment	04
Class test I (Objective Questions)	04
Class test II (Descriptive Questions)	04
Class test I (Objective Questions)	04
Class test II (Descriptive Questions)	04
Overall performance throughout the year (includes Attendance Behavior Discipline Participation in Different Activities)	05
Total	25
Elaboration: Assessment Theory	1
External Assessment	
Theory paper	75
Grand Total	100

	Practical -Part A				
Program Certificate		Class:	First Year	Session 2021-22	
_		B.Sc.			
	Subject: Chemistry				
1.	Course Code	S1-CHEM2			
2.	<b>Course Title</b>	Analytical Processes and Techniques (Paper II)			
3.	Course Type	Core Course			
4.	Course	By the end of this course students will learn the following			
	Learning	aspects of Chemistry:			
	Outcomes	1. Concepts and analytical methods in Chemistry.			
	(CLO)	2. Preparation of solutions of different concentrations.			
		3. Standardization of the solution.			
		4. Identification of Organic compounds by			

		chromatographic techniques.			
		5. Analysis of Spectral Techniques.			
5.	Credit Value	2			
6.	Total Marks	Maximum Marks: CCE- 25, University Exam (UE)-75	Min. Passing Marks: <b>33</b>		

External Assessment			
	Experiments to be performed in laboratory	50	
1.	Basic Analytical Exercises-	10	
	• Calibration of different weights and glass apparatus (measuring cylinder, burette, pipette, volumetric flasks).		
	• Preparation of solutions of different molarity/normality by weighing and dilution.		
2.	Ouantitative Analysis-	20	
3.	<ul> <li>Titrimetric Analysis         <ul> <li>Titrimetric Analysis</li> <li>Standardization of NaOH with Oxalic acid.</li> <li>Determination of carbonate and hydroxide present in mixture.</li> <li>Determination of carbonate and bicarbonate present in a mixture.</li> <li>Determination of free alkali present in different soaps/detergents.</li> </ul> </li> <li>Quantitative Analysis by Colorimetry-         <ul> <li>Verification of Lambert-Beer Law.</li> <li>Determination of concentration of colored compounds (e.g., C. CO., MM, O.)</li> </ul> </li> </ul>	10	
4.	<ul> <li>CuSO4. KMnO4).</li> <li>Qualitative Analysis <ul> <li>Systematic identification of organic compounds by qualitative analysis.</li> <li>Chromatography:</li> </ul> </li> <li>Identification by determination of the Rf values of the given organic/ inorganic compounds by paper / thin layer chromatography.</li> <li>Keywords/Tags: Analytical, Authentication, Molarity/ Normality, Standardization, Colorimetry, Qualitative Analysis.</li> </ul>		

## **Part C- Learning Resources**

#### Textbooks, Reference Books and OtherResources

#### **References:**

- 1. Skoog, D.A., and Leary, J.J.: Instrumental Methods of Analysis, Saunders College Publications, New York, 1992.
- 2. Vogel's textbook of quantitative chemical analysis, 7th edition.
- 3. Goswami A.K., Mehta Anita, Khanam Rehana, ORS., UGC Practical Chemistry VOL., I Pragati Prakashan, 2015.
- 4. Goyal Sudha, B.Sc. Chemistry Practical, Krishna Publication, 2017.
- 5. Tandon, M.N., Unified Rasayan Vigyan, Shivlal Agarwal & Company, 2018.

### Suggestive digital platform web links:

- 1. https://www.youtube.com/watch?v=0AlmRDzuTh8.
- 2. http://amrita.olabs.edu.in/?sub=73&brch=8&sim=133&cnt=1.
- 3. http://chemcollective.org/vlabs.
- 4. http://mas-jith.vlabs.ac.in/exp6/Quiz.html
- https://chem.libretexts.org/Ancillary\_Materials/Laboratory\_Experiments/Wet\_Lab\_Experiments/General\_Chemistry\_Labs/Online \_Chemistry Lab Manual/Chem 9Experiments/02%3AP aper\_ Chromatography \_of\_ Gel\_ Ink Pens\_(Experiment).
- 6. https://edu.rsc.org/experiments/leaf-chromatography/389.article.
- 7. https://edu.rsc.org/experiments/chromatography-of- sweets/455.article.
- 8. http://swe.mit.edu/outreach/virtual\_resources/paper\_chromatog raphy.pdf.
- 9. http://www.chem.latech.edu/~deddy/chem104/104Standard.html.
- 10. https://www.chem.purdue.edu/courses/chm224/Miscellaneous/ Model\_report\_Expt2-revised 2009.pdf.
- 11. https://www.webpages.uidaho.edu/ifcheng/Chem%20253/labs/ Experiment%203.pdf.
- 12. http://faculty.ccbemd.edu/~cyau/122%2007%20Acid- base%20titration%20AUG%202013.p df.
- 13. https://labbalances.net/blogs/blog/guide-to-calibration weights.

14. https://cdn2.hubspot.net/hubfs/2203666/Beamex\_White\_Papers /Beamex%20White%20Pape r%20- %20Weighing%20scale%20calibration%20ENG.pdf?hssc=1 07807261.6.1518193235316& hstc=107807261.215aea6ed7 77995a4967830c0f9aad.1516987215921.1518111962556.151 8193235316.17& \_hsfp=2102249448&hsCtaTracking=8918cf fa-b755-4f72-b4b1-24c1fa8d1a6d%7C12eb2e3f-4662-43eb-baf0-2da2a5d102b6.

Part D- Assessment and Evaluation				
Suggested Continuous Evaluation Methods:				
Internal Assessment	Marks	External Assessment	Marks	
<ul> <li>Class Interaction on-</li> <li>Common glassware and lab wares for solution preparation and analysis.</li> <li>Numerical problems related to solution preparation.</li> <li>Any other discussion.</li> <li>Note: description to be written in practical record.</li> </ul>	10	<i>Viva voce</i> on Practical	15	
Attendance	5	Practical Record File	10	
Assignments (Charts/Model/Seminar/Rural Service/Technology Dissemination/Report of Excursion/Lab Visits/ Survey/ Industrial Visit)	10	Table work/Experiments	50	
Total	25		75	

#### Department of Higher Education, Government of Madhya PradeshYearly Syllabus for Undergraduates As recommended by Central Board of Studies of Computer Science andApproved by H E the Governor of M. P. (As per NEP 2020) Session 2021-22

## **B.Sc. I Year Biotechnology Subject: Computer Science (Minor/Elective)**

Program Certificate		Class: First Year Session 2021-22			
		B.Sc.			
	Subject: Computer Science				
1.	Course Code	S1-COSC2T			
2.	Course Title	Programming Methodologies & Data Structures (Paper II)			
3.	Course Type	Core Course			
4.	Pre-requisition	To study this course a student must have had the subject Physics/Math's in class 12 <sup>th</sup> class.			
5.	Course	On completion of this course learners will be able to-			
	Learning	1. Develop simple algorithms and flow charts to solve			
	Outcomes	a problem with programming using top-down design			
	(CLU)	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. Will be familiar with fundamental data structures,			
		their implementation; become accustomed to the			
		description of algorithms in both functional and procedural styles.			
		6. Have knowledge of complexity of basic operations			
		like insert, delete, search on these data structures.			
		7. Possess ability to choose a data structure to suitably			
		model any data used in computer applications.			
		8. Design programs using various data structures			
		including hash tables, Binary and general search			
		trees, heaps, graphs etc.			
		9. Assess efficiency tradeoffs among different data			
		structure implementations.			

		<ul><li>10. Implement and know the applications of algorithms for searching and sorting etc.</li><li>11. Know the contributions of Indians in the field of programming and data structure.</li></ul>		
6.	Credit Value	4		
7.	Total Marks	Maximum Marks: 25+75	Min. Passing Marks: <b>33</b>	

	Part B- Content of the Course					
No. of Lectures (In hours per week): 2 Hrs. per week						
Total no. o	f lectures- 60					
Unit	Topics	No. of				
		Lectures				
Ι	Introduction to Programming- Program Concept, Characteristics	8				
	of Programming, Stages in Program Development, Algorithms,					
	Notations, Design, Flowcharts, Types of Programming					
	Methodologies.					
	Introduction to C++ Programming- Basic Program Structure In					
	C++, Data Types, Variables, Constants, Operators and Basic I/O.					
	Variables - Declaring, Defining and Initializing Variables, Scope of					
	Variables, Using Named Constants, Keywords, Casting of Data					
	Types, Operators (Arithmetic, Logical and Bitwise), Using					
	Comments in programs, Character 1/O (getc, getchar, pute, putchar					
	etc.), Formatted and Console I/O (printf0, scanf0, cin, cout), Using					
	Basic Header Files (stdio.h, iostream.h, conio.h etc.)					
	Simple Expressions in C++ (including Unary Operator					
	Expressions, Binary Operator Expressions), Understanding					
	Operators Precedence in Expressions					
	Conditional Statements if construct, switch-case construct.					
п	Iterative Statements while, do-while, and for loops, Use of break	10				
	and continue in Loops, Using Nested Statements (Conditional as					
	well as Iterative)					
	Functions Top-Down Design, Pre-defined Functions, Programmer					
	- defined Functions, Local Variables and Global variables,					
	Functions					
	with Default Arguments, Call-By-Value and Call-By-Reference					
	Parameters, Recursion.					
	Introduction to Arrays - Declaration and Referring Arrays,					
	Arrays in Memory, Initializing Arrays. Arrays in Functions, Multi-					
	Dimensional Arrays.					

III	Structures -Member Accessing, Pointers to Structures, Structures	8
	and Functions, Arrays of Structures.	
	Unions- Declaration and Initialization.	
	Strings - Reading and Writing Strings, Arrays of Strings, String	
	and	
	Function, Strings and Structure, Standard String Library	
	Functions. Searching Algorithms- Linear Search, Binary Search.	
	File Handling - Use of files for data input and output, merging	
187	and copying files.	10
11	Data Structure - Basic concepts, Linear and Non-Linear data	12
	structures.	
	Algorithm Specification-Introduction, Recursive	
	algorithms, Data Abstraction, Performance analysis.	
	<b>Linked List</b> - Singly Linked Lists, Operations,	
	Concatenating,	
	circularly linked lists-Operations for Circularly linked lists,	
	Doubly Linked Lists- Operations.	
	Array - Representation of single, two dimensional arrays,	
	sparse matrices-array and linked representations.	
	<b>Stack</b> - Operations, Array and Linked Implementations,	
	Applications- Infix to Postfix Conversion, Postfix Expression	
	Evaluation, Recursion Implementation.	
V	<b>Oueue-</b> Definition Operations Array and Linked	10
•	Implementations Circular Queue-Insertion and Deletion	
	Operations, Dequeue (Double Ended Queue), Priority Queue	
	Implementation	
	Trans Demonstration of Trans Discourt from Demonstration of	
	<b>Trees</b> - Representation of Trees, Binary tree, Properties of	
	Binary	
	Trees, Binary Tree Representations- Array and Linked	
	Representations, Binary Tree Traversals, Threaded Binary	
	Trees.	
	Heap- Definition, Insertion, Deletion.	
VI	Graphs - Graph ADT, Graph Representations, Graph Traversals,	10
	Searching.	
	Hashing- Introduction, Hash tables, Hash functions, Overflow	
	Handling.	
	Sorting Methods, Comparison of Sorting Methods, Search Trees - Binary Search Trees A VI Trees Definition and	
	Fxamples	
	Examples.	

VII	Indian Contribution to the field: Innovations in India, origin of	2	
	Julia Programming Language, Indian Engineers who designed new		
	programming languages, open-source languages, Dr. Sartaj Sahni -		
	computer scientist - pioneer of data structures, Other relevant		
	contributors and contributions.		
Keywords/Tags: Programming, C++, Data Structures, Expressions, Control, File Handling,			
Arrays, Sta	ack, Queue, Linked list, Tree, Graph, Structure, Union, Hash, Search,	Sort,	

Algorithm

## **Part C- Learning Resources**

## Textbooks, Reference Books and Other Resources

- Lipschutz: Schaum's outline series Data structures, Tata McGraw-Hill.
- Problem Solving and Program Design ni C, J. R. Hanly and E. B. Koffman, Pearson, 2015.
- E. Balguruswamy, "C++ " TMH Publication ISBN 0-07-462038-X.
- Herbertz Shield, "C++ The Complete Reference "TMH Publication ISBN 0-07-463880-7.
- R. Lafore, 'Object Oriented Programming C++".
- N. Dale and C. Weems, Programming and problem solving with C++: brief edition, Jones& Bartlett Learning.
- Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning.
- Sartaj Sahani, Data Structures, Algorithms and Applications with C++, McGraw Hill.
- Robert. L Kruse, "Data Structures and Program Design in C++", Pearson.
- D.S. Malik, Data Structure using C++, Second edition, e n g a g e Learning.
- M. A. Weiss, Data structures and Algorithm Analysis in C, 2nd edition, Pearson.

## Suggestive digital platform web links:

https://www.youtube.com/watch?v=BCIS40yzssA https://www.youtube.com/watch?v=vLnPwxZdW4Y&vl=en https://www.youtube.com/watch?v=UmmIZQ5ltZw https://www.youtube.com/watch?v=AT14ICXuMKI&list=PLdo5W4Nhv31bbKJzrsKfMpo\_gr xuLI8LU

## Suggested equivalent online courses

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

Part D- Assessment and Evaluation			
Internal Assessment	<b>External Assessment:</b>		
Continuous Comprehensive Evaluation (CCE): 25 Marks	University Exam Section: 75		
Shall be based on allotted assignments and Class Tests. The	Time: 02:00 Hours		
marks will be as follows:			

Assessment and	10 Marks	Section (A): Three	03×03=9 Marks
presentation of		Very Short Questions	
assignment		(50 Words Each)	Or
Class test I	5 Marks	or	
(Objective		Nine MCQ questions	
Questions)			01×09=9 Marks
Class Test II	5 Marks	Section (B): Four Short	04×09=36
(Descriptive		Questions (200 Words	
Questions)		Each)	
Class Test III	5 Marks	Section (C): Two Long	02×15=30
(Based on solving		Questions (500 Words	
programming			
problems)			
Total	25 Marks	Total	75 Marks

Any remarks/suggestions: Focus of the course /teaching should be on developing ability of the student in analyzing a problem, building the logic and efficient coded for the problem.

	Practical -Part A				
Program Certificate		Class:		First Year	Session 2021-22
		B.Sc.			
		Sul	oject: (	Computer Sc	ience
1.	Course Code	<b>S1-CC</b>	)SC2P	•	
2.	Course Title	Office	Tools	and Program	nming Methodology Lab(Paper II)
3.	Course Type	Core C	Course		
4.	Pre-Requisite	To stu	dy this	course a stud	ent must have had the subject
		Physic	s/Math	n's in class 12	<sup>th</sup> class.
5.	Course	On con	mpletic	on of this cour	rse, learners will be able to:
	Learning	1.	Devel	lop simple alg	gorithms and flow charts to solve a
	Outcomes		proble	em with prog	ramming using top-down design
	(CLO)	principles.			
		2. Writing efficient and well-structured computer			
		algorithms/programs.			
		3. Learn to formulate iterative solutions and array			
			proce	ssing algorith	ms for problems.
		4.	Use 1	recursive tech	niques, pointers and searching
			metho	ods in program	nming.
		5. Possess the ability to choose a data structure to			
			suitab	oly model any	data used in computer applications.
		6.	Imple	mentation of	algorithms for searching and
			sortin	g.	
6.	Credit Value	2			

7.	Tota	al Marks	Maximum Marks:25+75	Min. Passing Mark	s: <b>33</b>
			Part B- Content of the Co	ourse	
No. of L	ab Pra	actical (In hour	rs per week): 2 Hours per weel	k	
Total No	$\frac{1}{1}$ of la	ab- 30 Hours			NT C
Suggesti	ve list	t of Practicals			No. of labs
		I.	Office Tools		30
	a.	Using a Text	t Editor Tool		
	1.	Create a docu	ument and apply different Edit	ing options.	
	2.	Create Banne	er for your college.		
	3.	Design a Gre	eting Card using Word Art for	different festivals.	
	4.	Design your	Bio data and use page borders	and shading.	
	5.	Create a docu	ument and insert header and fo	oter, page title, date,	
	-	time, apply v	arious page formatting feature	s etc.	
	6.	Implement N	lail Merge.		
	7.	Insert a table	into a document and try differ	ent formatting options	
	L	for the table.	- John - 4 Trank		
	<b>D.</b> 1	Using a Spre	alage Timetable		
	1.	Design your	class I linetable.		
	2. 2	Prepare a Ma	irk Sheet of your class result.	organization	
	5. 4	Prepare a Sal	any sup of an employee of an	of Election Desults	
	4. 5	Prepare a ger	chart & pie chart for analysis	of Election Results.	
	5. 6	Work on the	following exercises on a Work	zhook	
	0.		nonowing exercises on a work	1000K.	
		h Re	name the old Sheet		
		c. Ins	sert a new Sheet into an existin	g Workbook.	
		d. De	lete the renamed Sheet.		
	7.	Prepare an A	ttendance sheet of 10 students	for any 6 subjects of	
		your syllabus	s. Calculate their total attendan	ce, total percentage of	
		attendance of	f each student & average of att	endance.	
	8.	Create a world	ksheet of Students list of any 4	faculties and perform	
		following dat	tabase functions on it.	-	
		a. So	ort data by Name		
		b. Fi	ilter data by Class		
		c. Su	ubtotal of no. of students by C	lass.	
	c.	Using a Pre	sentation Tool		
	1. I	Design a prese	ntation of your institute using	auto content wizard,	
	Ċ	lesign template	e and blank presentation.		
	2. I	Design a prese	ntation illustrating insertion of	pictures, Word Art	
	8	and ClipArt.			
	3. I	Design a prese	ntation, learn how to save it in	different formats,	
	C	copying and op	pening an existing presentation	l.	

4.	Design a presentation illustrating insertion of movie, animation and	
5	Sound.	
5.	different effects)	
6	Design a presentation using charts and tables of the marks obtained	
0.	in class.	
Giv	en the problem statement, students are required to formulate	
prol	olem, develop flowchart/algorithm, write code in C++, execute,	
and	test it. Students should be given assignments on following:	
1.	a. To learn elementary techniques involving arithmetic operators	
	and mathematical expressions, appropriate use of selection (if,	
	switch, conditional operators) and control structures.	
	b. Learn how to use functions and parameter passing in	
	functions, writing recursive programs.	
2.	Write a program to swap the contents of two variables.	
3.	Write a program for finding the roots of a Quadratic Equation.	
4.	Write a program to find area of a circle, rectangle, square using	
	switch case.	
5.	Write a program to check whether a given number is even or odd.	
6.	Write a program to print table of any number.	
7.	Write a program to print Fibonacci series.	
8.	Write a program to find factorial of a given number.	
9.	Write a program to convert decimal (integer) number into	
	equivalent binary number.	
10	. Write a program to check given string is palindrome or not.	
11	. Write a program to perform multiplications of two matrices.	
12	. Write a program to print digits of entered number in reverse order.	
13	. Write a program to print sum of two matrices.	
14	. Write a program to print multiplication of two matrices.	
15	. Write a program to generate even/odd series from Ito 100.	
16	. Write a program whether a given number is prime or not.	
	. Write a program for call by value and call by reference.	
18	. Write a program to generate a series $1+1/1!+2/2!+3/3!+-$	
10	+11/11! Write a program to graate a pyramid structure	
19	. write a program to create a pyramid structure.	
**		
**	*	
**	**	
20	Write a program to create a pyramid structure.	
	1	
	12	
	123	
	1234	
21	. Write a program to check entered number is Armstrong or not.	
22	. Write a program for traversing an Array.	

23. Write a program to input N numbers, add them and find average.

24. Write a program to find largest element from an array.

25. Write a program for Linear search.

26. Write a program for Binary search.

27. Write a program for Bubble sort.

28. Write a program for Selection sort.

**Keywords/Tags:** Programming, C++, Data Structures, if, else, for, while do, File Handling, call by value, call by reference, recursion, Arrays, Union, Hash, Linear search, Binary search, Bubble sort, Selection sort.

#### **Part C- Learning Resources**

#### **Textbooks, Reference Books and Other Resources**

- Problem Solving and Program Design in C,. J R. Hanly and E. B. Koffman, Pearson, 2015.
- E. Balguruswamy, "C++ " TMH Publication ISBN 0-07-462038-X.
- Herbertz Shield, "C++ The Complete Reference "TMH Publication ISBN 0-07-463880-7.
- R. Lafore, 'Object Oriented Programming C++."
- N. Dale and C. Weems, Programming and problem solving with C++: brief edition, Jones & Bartlett Learning.
- Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, e n g a g e Learning.
- Sartaj Sahani, Data Structures, Algorithms and Applications with C+, McGraw Hill.
- Robert. L Kruse, "Data Structures and Program Design ni C++", Pearson.
- D.S. Malik, Data Structure using C+, Second edition, Cengage Learning.
- M. A. Weiss, Data structures and Algorithm Analysis in C, 2nd edition, Pearson.
- Lipschutz: Schaum's outline seriesData structures, Tata McGraw-Hill

## Suggestive digital platform web links

https://www.youtube.com/watch?v=BCIS40yzssA https://www.youtube.com/watch?v=vLnPwxZdW4Y&vl=en https://www.youtube.com/watch?v=UmmIZQ5ltZw https://nptel.ac.in/courses/106/106/106106127/

## Suggested equivalent online courses:

https://nptel.ac.in/courses/106/105/106105151/ https://nptel.ac.in/courses/106/105/106105171/ https://onlinecourses.swayam2.ac.in/cec19 mg35/preview

Part D- Assessment and Evaluation	
Internal Assessment	<b>External Assessment:</b>
Continuous Comprehensive Evaluation (CCE): 25 Marks	University Exam
	Section: 75 Marks
	Time: 02:00 Hours

Internal Assessment	Marks	External Assessment	Marks
Hands on Lab Practice	5 Marks	Practical record file	10 Marks
Lab Test from practical list & internal viva	12 Marks	Viva voce on practical	15 Marks
Assignments (Charts/Model/Seminar/Rural Service/Technology Dissemination/Report of Excursion/Lab Visits/ Survey/ Industrial Visit)	8 Marks	Table works/Experiments	50 Marks
Total	25 Marks	Total	75 Marks

Any remarks/suggestions: Focus of the course /teaching should be on developing ability of the student in analyzing a problem, building the logic and efficient coded for the problem.

#### Department of Higher Education, Government of Madhya PradeshYearly Syllabus for Undergraduates As recommended by Central Board of Studies of Computer Science andApproved by H E the Governor of M. P. (As per NEP 2020) Session 2021-22

#### **B.Sc. I Year**

#### Subject: English Language and Indian Culture (Foundation)

		PART A: I	Introduction		
Program: UG Level. Class: I Year			Year: 2021-22	Session: 2021-22 onwards	
		Subject: Foun (Eng	dation Course glish)		
1.	Course Code		X 1-FCHB1T		
2.	Course Title		English Language	and Indian Cult	ure
3.	Course Type (Co Course/Elective/C icElective/ Vocat	re Jener Jonal	Foundation Cour	se	
4.	Pre-Requisite (if	any)	To study this cou basic knowledge. of English langua studied by all the the Foundation Co	rse, a student sl age. This cours estudents of UG ourse category.	hould have e will be level under
5.	Course Learning Outcomes(CLO)		<ol> <li>Through this court</li> <li>Prepare for varial developing their competence.</li> <li>Promote their or being exposed at their interpreta</li> <li>Build and enhild. Develop their communication strengtheninggriphen</li></ol>	se the students v ous competitive irEnglish langua comprehension sl to avariety of tex tions. hance their voc mammar and usag es which make onalheritage and issues, making to izens.	vill be able to: exams by ge kills by kts and cabulary. skills by ges. them

6.	6.Credit Value2		
7.	Total Marks	Marks Max. Marks: 50 Min. Pass Marks:	
	PART B: Co	ontent of the urse	
Total	No. of Lectures-Tutorials- Practical (in ho	ours per week): L-T-P	
	Total No. o	f Lectures:	
Unit	Topics		No. of Lectures
Ι	<b>Reading, Writing and Interpretation S</b>	Skills:	
	I. Where the Mind is Without Fear—Rat	oindranath Tagore [Key]	
	Word: Patriotism]		
	2. National Education — M. K. Gandhi	[Key Word:	
	Edification]		
	3. The Axe- R.K Narayan [Key Word:	Environment]	
	4. The Wonder That Was India- A.L Ba	sham (an excerpt)	
	[Key Word: Indianness]		
	5. Preface to the Mahabharata C. Rajagopalachari [Key		
TT	Word: Indian Mythology		
11	Comprenension Skill:		-
	Unseen Passage followed by Multiple cr	noice questions U.	)
III	Basic Language Skills 1: Vocabulary B	Building: Suffix, Prefix,	
	Synonyms, Antonyms, Homophones, Ho	omonyms and One-	5
	word substitution.		
	2: Basic Grammar: Noun, Pronoun, Adjective, Verb, Adverb,		
	Prepositions, Articles, Time, and Tense		
	PART C: Lear	ning Resources	
	Textbooks, Refer	ence Books, Other	
	Reso	ources	
Sugge	sted Readings		
Esse	ntial English Grammar - Raymond Murphy	, Cambridge University Pr	ess.
• Prac	ctical English Grammar Exercises 1- A. J. T	Thomson & A. V. Martine	, Oxford India.

Practical English Usage - Michael Swan, Oxford
English Grammar in Use - Raymond Murphy, Cambridge University Press.

	Part D: Assessment and Evaluation				
Max Marks:50	Min Marks: 17	University Exam (UE)	Total:50		
	U.E. Time 2 Hours				
External	Assessment (UE)	Time: 2 Hours			
Fifty Mu	ltiple Choice				
/Objective	/True-False type				
questionst	o be asked. Each				
question c	arries one mark				

Department of Higher Education, Government of Madhya Pradesh Yearly Syllabus for Undergraduates As recommended by Central Board of Studies of Computer Science and Approved by H E the Governor of M. P. (As per NEP 2020) Session 2021-22

**B.Sc. I year** 

### Subject: Environmental Education (Foundation)

Part A Introduction .				
	Subject: Environmental Education			
Program UG Level Certificate	Class: I Year	First Year	Session: 2021-22 onwards	
1.	Course Code	X1- FCAC1T		
2.	Course Title	Environmental Educ	cation	
3.	Course Type (Core Course/Elective/Generic Elective/ Vocational	Foundation Course		
4.	Pre-Requisite (if any)	A course intended to about the life of huma integral part of enviro inculcate the skills re- environment from all To study this course, knowledge about the components, pollution ecosystem at senior so level:	create awareness an beings which is an onment; and to quired to protect the sides. the student must have environmental n, biodiversity, and econdary, class 12 <sup>th</sup>	

5.	Course Learning Outcomes (CLO)	1.	To understand various aspects of life
			form's, ecological processes, and the
			impacts on them by the human during
			Anthropocene era.
		2.	To build capabilities to identify
			relevant environmental issues, analyze
			the various underlying causes, evaluate
			the practices and policies, and develop
			framework to make inform decisions.
		3.	To develop empathy for all life forms,
			awareness, and responsibility toward
	· ·		environmental protection and nature
			preservation.
		4.	To develop the critical thinking for
			snaping strategies such as scientific,
			social, economic, administrative &
			legal, environmental protection,
			conservation of biodiversity,
			development
		5	To prepare for the competitive exams
6	Credit Value	2	To prepare for the competitive exams.
0.		<i>2</i>	
7.	Max Marks: 50	Min. P	ass Marks:17

PART B: Content of the Course Total No. of Lectures-15 Hrs. (01 hours per week):			
	Total No. of Lectures: 15		
Unit	Topics	No. of Lectures	
Ι	<ul> <li>Environment and Natural Resources:</li> <li>Multidisciplinary nature, Scope, and Importance of Environment</li> <li>Components of Environment: Atmosphere, Hydrosphere, Lithosphere, andBiosphere.</li> <li>Brief account of Natural Resources and associated problems: Land Resource, Water Resource, Energy Resource</li> <li>Concept of Sustainability and Sustainable Development <i>Keywords:</i> Environment, Forest, Mineral, Food, Land, Water, Energy, Sustainable Development</li> </ul>	5 Hrs.	

II	Biome, Ecosystem and Biodiversity:	
	Major Biomes: Tropical, Temperate, Forest, Grassland,	
	Desert, Tundra, Wetland, Estuarine and Marine.	4 Hrs.
	• Ecosystem: Structure function and types of their Preservation	
	& Restoration.	
	• Biodiversity and its conservation practices.	
	Keywords: Biome, Ecosystem, Biodiversity	
III	Environmental Pollution, Management and Social Issues:	
	• Pollution: Types, Control measures, Management, and	
	associated problems.	
	• Environmental Law and Legislation: Protection and	6 Hrs.
	conservation Acts.	
	• International Agreement & Programme.	
	• Environmental Movements, communication, and public	
	<ul> <li>National and International organizations related to environment</li> </ul>	
	conservation and	
	monitoring	
	<ul> <li>Role of information technology in environment and human</li> </ul>	
	health	
	<i>Keywords:</i> Pollution. Environmental Legislation.	
	Environmental Movement.	
	Environmental programme and organization.	

Suggested activities: (at least one)
1. Visit to an area to document environmental assets: rivers / forest / flora /fauna.
2. Visit to a local polluted site Urban / Rural/ Industrial / Agricultural
3. Study of simple ecosystem.
PART C: Learning Resources
Textbooks, Reference Books, Other Resources
• Singh; J.S., Singh S.P. and Gupta, S.R.; "Ecology; Environment Science and
Conservation ", SChand publishing, New Delhi, (2018).
• Divan, S. and Rosencranz, A., "Environmental Law and Policy in India: Cases,
Material & Status" Oxford University Press, India, (2002) 2 <sup>nd</sup> Edition.
• Odum, E.P., "Fundamentals of Ecology ", Philadelphia Saundres, (1971)
• Bharucha, Erach, "Environmental studies " Universities Press India Pvt. Ltd. Hyderabad
(2014) (Hindi Edition also available).
• Kaushik, Anubha, Kaushik, C.P. "Perspectives in Environmental Studies "New age International Publishers, (2018), 6 <sup>th</sup> Edition.

• Asthana, D. K Asthana Meera, "A Textbook of Environmental Studies", S. Chand. Publishing, New Delhi (2007)

- National Digital Library (https://ndl.iitkgp.ac.in/homestudy/science) •
- Epg- pathshala (https://epgp.inflibnet.ac.in/Home/Download) •
- NPTEL (https://nptel.ac.in/course.html) •
- Coursera (https://www.coursera.org/search?query=environmental+science&page=1).

#### Suggested equivalent online course —

- i.
- ii.
- iii.
- iv.
- The Health Effects of Climate Change (edx) Climate Change: Financial Risks and Opportunities (edx) Introduction to Environmental Law and Policy (coursera) Women in environmental biology (coursera) Our Earth: It's Climate, History, and Processes (coursera) Eacleanty physicology environmental science (national digita v.
- Ecology, physiology, environmental science (national digital library) vi.

#### **Department of Higher Education, Government of** Madhya Pradesh Yearly Syllabus for Undergraduates As recommended by Central Board of Studies of Computer Science and Approved by H E the Governor of **M. P. (As per NEP 2020) Session 2021-22**

Program: Certificate course Class: B.A		<b>A. 1</b> Year	Year: 2021	Session: 2021 — 2022				
Subject: Yogic Science								
I.	Course Code		Al-YOSC	Al-YOSC1F				
2.	Course Title		Yoga and Meditation (Paper-2)					
3.	Course Type		Foundation Course					
4. Pre-requisite (If any)		For BA I Year students, this course is compulsory fo						
			all.					
5.	Course Learning Outcomes		After studying this course, students will be able to:					
			• Take care of their own Physical Mental emotional,					
			social, and spiritual health.					
6:	Credit Value		Theory-2					
7.	Total Marks		Max. Mar	·ks: 50	Min. Passing Marks: 17			

# **B.Sc. I Year Subject: Yoga and Meditation (Foundation)**

	Total numbers of Lectures (in hours per week): 2 hours per week					
	Total Lectures: 30 hours; L — T — P: 2 — 0 — 0					
Unit	Topics	No. of				
S		Lecture				
		s				
Ι	Introduction to Yoga	10				
	and Yogic Practices					
	1. Yoga: Etymology, definitions, aim, objectives, and misconceptions					
	2. Yoga: Its Origin, history, and development					
	3. Rules and regulations to be followed by Yoga Practitioners					
	4. Introduction to Yoga practices					
	5. Shatkarma: meaning, purpose and their significance in Yoga Sadhana					
	6. Introduction to Yogic Loosening practices and Surya Namaskar					
	<b>Key Words:</b> History and Development of Yoga, Shatkarma, Common Yogic Practices.	10				
11	Breathing Practices and Pranayama	10				
	1. Sectional Breathing (Abdominal, Thoracic and					
	Clavicular)					
	2. Yogic Deep Breatning					
	3. Concept of Puraka, Rechaka and Kumbhaka					
	4. Concept of Bandha and Mudra					
	5. Anuimoa viioma/Nadi Snodnana					
	6. Shitali 7. Dhramari					
	/. BIIFAIIIAFI Ver Words: Sectional breathing Deer breathing Deardha					
	Rey worus: Sectional Dreatining, Deep Dreatining, Bandina					
TTT	& Mudra, Sintan, Diraman Droations loading to Moditation	10				
111	1 Desitation of Dranava Mantra	10				
	2 Recitation of Hymns in vocations and pravers					
	2. Anter Maun					
	A Breath Meditation					
	5 Om Dhyana					
	5. On Diyana					
	<b>Keywords</b> Pranava Mantra, Anter Maun, Breath					
	Meditation. Om Dhyana					
	······································					

	Part-C: Learning Resources				
	Textbooks, Reference Books, Other resources				
1.	Singh S. P & Yogi Mukesh: Foundation of Yoga, Standard Publication, New Delhi, 2010.				
2.	Swami Dhirendra Brahmchari: Yogasana Vijnana, Dhirendra Yoga Publication, New Delhi,1966.				
3.	Saraswati, Swami Satyananda: Asana, Pranayama, Mudra, Bandha (APMB), Yoga Publication Trust, Munger, 2013.				

- 4. H. R. Nagendra: Asana, Pranayama, Mudra, Bandha, Swami Vivekananda Yog Prakashan, **Bangalore, 2002.**
- 5. Ishwar Bhardwaj: SaralYogasana, Satyam Publishing House, New Delhi, 2018.
- 6. Shri Rai Singh Chouhan: Mudra Rahasya, Bhartiya Yog Sansthan, New Delhi, 2014.
- 7. Dr. Vishwanath Prasad Sanha: Dhyan Yoga, Bhartiya Yog Sansthan, New Delhi, 1987.
- 8. Shri Deshraj: Dhyan Sadhana, Bhartiya Yoga Sansthan, New Delhi, 2015.

Suggestive digital platforms web links:

1. www.rishikeshnathyogshala.com

Suggestive equivalent online Courses-

- 1. Liatps://sahaNdi.com/hathayoga-course
- 2. https://theyogainstitute.org/

Part D: Assessment and Evaluation							
Maximum Marks: 50 University Examination (Objective)- 50							
Time: 01.00 Hour							
External Assessment:	Objective questions	50					
University Examination							
	Total	50					