Department of Computer Science

Bachelor of Science (Microbiology)

B.Sc. (MB)

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 Microbiology Subject: Microbiology (Major - I)

Program Certificate		Class:	First Year	Session 2021-22	
		B.Sc.			
		Subject: Mi	crobiology		
1.	Course Code	S1-MBIO1T	I		
2.	Course Title	General Mic	robiology an	d Cell Structure (Paper I)	
3.	Course Type	Core Course			
4.	Pre-requisition	To study this Biology in cla	course a stud ass 12 th .	ent must have had the subject	
5.	Course	After comple	ting this cour	se in Microbiology, a student	
	Learning	shall understand-			
	Outcomes (CLO)	 Indian traditional knowledge and historical background of Microbiology. Structure and transmission of Viruses. Cell structures and cell organization of bacteria. Different kinds of unicellular prokaryotic and eukaryotic microorganisms based on specific characteristics. 			
		General characteristics of important Eubacteria			
6.	Credit Value	4			
7.	Total Marks	Max. Marks:	25+75	Min. Passing Marks:33	

	Part B- Content of the Course	
Total No	. of Lectures- 60	
Lectures	tutorials-Practical (in hours per week): L-T-P:4-0-0	-
Unit	Topics	No. of Lectures
1	The Microbial World	15
	1.1.Indian traditional knowledge and global historical	
	background of Microbiology.	
	1.2. Theory of Biogenesis, germ theory of disease, Fermentation.	
	1.3.Significance of Microbiology-	
	a) Branches of Microbiology	
	b) Thrust area of Microbiology – Genetic engineering	
	and Biotechnology	
	1.4. Contribution of following scientists in the field of	
	Microbiology- Louis Pasteur, Robert Koch, Edward Jenner,	
	Alexander Fleming, Joseph Lister, Serge N. Winogradsky,	
	Martinus Willem Beijerink, Dmitrii Ivanowsky, Wendell M.	
	Stanley and Hans Christian Gram.	
	Key words: History of Microbiology, Renowned microbiologists, Genetic Engineering, Biotechnology	
2	Acellular and Prokaryotic Microorganisms	15
	2.1. Virus-General characters of following Viruses-	
	Bacteriophage (T4 and λ phage), Plant viruses (TMV),	
	Prions and Viroids.	
	2.2. Whittaker's System of Five Kingdom Classification:	
	Monera, Protista, Fungi, Plantae and Animalia.	
	2.3.Carl Woese's three domain system of Classification:	
	Archea, Eubacteria, and Eukaryotes.	
	2.4. Bacteria - Study of Spirochete, Rickettsia, Chlamydia,	
	Mycoplasma and Actinomycetes.	
	2.5. Cyanobacteria- Study of Anabaena and Spirulina.	
	Key words: Prokaryotes, Whittaker, Carl Woese, Bacteria, Cyanobacteria	

3.	Eukaryotic Microorganisms	15
	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	
4.	Introduction to Microbial Cell Structure	15
	4.1.Study of Bacteria - Size, shape, and arrangement of	
	bacterial cells.	
	4.2.Structures External to Plasma Membrane- Glycocalyx	
	(capsule,	
	slimelayer), flagella, fimbrae, stalk, prostheca and cell wal	
	of Gram +ve and Gram -ve bacteria.	
	4.3.Structures Internal to Cell wall - Cell membrane,	
	cytoplasm,	
	cytoplasmic inclusions, genome, spores, and cysts.	
	4.4.Reproduction in Bacteria- Binary fission, budding and	
	fragmentation.	
	Kev words: Bacterial cells, Gram Positive Bacteria, Gram	
	Negative, Binary Fission	

Part C- Learning Resources

Textbooks, Reference Books and Other Resources

Suggested Readings:

- 1. Pelezar, M.J., Chan, E.C.S. and Krieg, N.R., "Microbiology". Tata McGraw-Hill, New Delhi. (2001).
- 2. Tortora G.J., Funke B.R., and Case C.L., "Microbiology: An Introduction." 9th edition Pearson Education. (2008).
- 3. Willey J.M., Sherwood L.M., and Woolverton C.J., "Prescott's Microbiology". 9th edition. McGraw Hill Higher Education. (2013).
- 4. Madigan, M.T., Martinko, J.M., Dunlap, P.V. and Clark D.P., "Brock Biology of Microorganisms, 12' Edition. Pearson Benjamin Cummings, San Francisco. (2009).
- 5. Sumbali, Geeta and Mehrotra, R.S., "Principles of Microbiology". McGraw Hil Edition. (2017).
- 6. Ananthanarayana, R. and Panicker, C.K.S., "Textbook of Microbiology", 6 ' Edition. Oriental Longman Publications, USA. (2000).
- 7. Dubey, R.C. and Maheshwari,D.K., "A Textbook of Microbiology". S. Chand &Company Ltd., New Delhi. (2008).
- 8. Sharma, P.D., "Microbiology". Rastogi Publications, Meerut. (2014).
- 9. Singh, R.P., "Applied Microbiology". Kalyani Publishers, New Delhi. (2007).
- 10. Shammi, Q.J., "Microbiology-I'. Kailash Pustak Sadan, Bhopal. ISBN: 978-81-89900-43-4.
- 11. Shammi, Q.J. and Uike, J., "Cel Biology and Immunology". Kailash Pustak Sadan, Bhopal. ISBN: 978-81-89900-95-3.

Suggested equivalent online courses:

- 1. <u>https://www.mooc-list.com/course/small-and-mighty-introduction-microbiology-</u> <u>futurelearn</u>
- 2. <u>https://www.mooc-list.com/course/microbiology-saylororg</u>
- 3. https://www.mooc-list.com/course/bacteria-and-chronic-infections-coursera
- 4. <u>https://www.coursera.org/lecture/bacterial-infections/1-1-introduction-to-bacteria-by-</u> bioinformatician-phd-peder-worning-HZ64m
- 5. https://openstax.org/books/microbiology/pages/1-3-types-of-microorganisms
- 6. <u>https://openstax.org/books/microbiology/pages/4-1-prokaryote-habitats-relationships-and-</u> microbiomes
- 7. https://swayam.gov.in/explorer?searchText-microbiology

Part D- Assessment and Evaluation							
Suggested Continuous Evaluation	Suggested Continuous Evaluation Methods:						
Maximum Marks:	100						
Continuous Comprehensive Ev	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: 25	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					
	1						
Any remarks/suggestions: Nil							

	Part A- Introduction					
Program Certificate		Class:	First Y	ear	Session 2021-22	
_		B.Sc.				
		Subject: Mi	crobiolog	у		
1.	Course Code	S1-MBIO1P				
2.	Course Title	Study of Micr	roorganis	ms (Paper 1)	
3.	Course Type	Core Course	Core Course			
4.	Pre-requisition	To study this course a student must have had the subject Biology in class 12 th				
5.	Course Learning Outcomes (CLO)	 After completing this course in Microbiology, a student shall understand- Isolation of various types of bacteria and yeasts. Microscopic examination of various types of bacteria, fungi, and protozoa. Structure and important animal, plant and bacterial viruses using electron micrographs 				
6.	Credit Value	2				
7.	Total Marks	Max. Marks: 25+75 Min. Passing Marks: 33				

	Part B- Content of Practical Course					
Total No	Total No. of Lectures-30					
Tutorials	-Practical (in hours per week): L-T-P:0-0-2					
S. No.	Name of the Exercise	No. of Lab (Hours)				
1.	Isolation of autotrophic bacteria and Cyanobacteria,	9				
	Rhizobia from root nodules					
2.	Isolation of lactobacillus from curd.	3				
3.	Isolation of yeast from ripened fruits.	3				
4.	Preparation of temporary wet mount and microscopic	4				
	examination of Mucor, Aspergillus, Rhizopus and					
	Penicillium.					
5.	Preparation of smear and microscopic examination of	3				
	Staphylococcus, Lactobacillus, Escherichia, Vibrio and					
	Leptospira.					
6.	Preparation of temporary wet mount and microscopic	4				
	examination of Amoeba, Euglena, Paramaecium and					
	Chlamydomonas.					
7.	Study of the structure of important animal viruses	1				
	(rhabdo, influenza, paramyxo, hepatitis B and					
	retroviruses) using electron micrographs.					
8.	Study of the structure of important plant viruses	1				

	(caulimo, Gemini, tobacco ring spot, cucumber mosaic and alpha-alpha mosaic viruses) using electron		
	micrographs		
9.	Study of the structure of important bacterial viruses	1	
	$(\Phi X174, T4, \lambda \text{ phage})$ using electron micrograph		
10.	Any other experiment may be designed on the basis of	1	
	theoretical aspects		
Key words: Isolation of bacteria, Bacteria cell structure, Fungi cell structure, Protozoa cell			

Key words: Isolation of bacteria, Bacteria cell structure, Fungi cell structure, Protozoa cell structure, Virus.

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

Suggested Readings:

- 1. Cappuccino. J. and Sherman. N.. "Microbiology: A Laboratory Manual", 9th edition. Pearson Education Limited. (2010).
- 2. Dubev. R.C. and Maheswari, D.K., "Practical Microbiology", S. Chand & Co. Ltd., New Delhi. (2002).
- 3. M. Gopal Reddv.M. Reddv. M.N. Saigopal. D.V.R. and Mallaiah K.V. "Laboratory Experiments in Microbiology", Himalaya Publishing House, Mumbai. (2007).
- 4. Aneia. K.R.. "Laboratorv Manual of Microbiology and Biotechnology. 2" Edition", Meditech Scientific International. (2018).
- 5. Patel. Rakesh J. and Patel Kiran. R.. "Experimental Microbiology Vol. I and Vol. II". Aditya Prakashan, Ahmedabad. (2009).
- 6. Varghese. Naveena and Jov. V. "Microbiology Laboratory Manual" Ed.1, Aromatic and Medicinal Plants Research Station, Odakkali, Ernakulam, Kerala. (2014).
- 7. Shammi. O.J.. "Microbiology Tools and Techniques", Kailash Pustak Sadan, Bhopal. ISBN: 978-81-89900-38-0 (In Hindi also).
- 8. Grainger.John. Hurst. Janet and Burdass. Dariel. "Basic Practical Microbiology: AManual" The Society for General Microbiology. (2001).

Suggested Digital Platforms/Web Links:

1. https://www.mooc-list.com/course/introduction-practical-microbiology-futurelearn 2.https://study.com/articles/List_of_Free_Online_Microbiology_Courses_and__Training_Options.html.

Part D- Assessment and Evaluation					
Suggested 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	10	Table work/Experiments	50		
(Charts/Model/Seminar/Rural					
Service/Technology					
Dissemination/Report of					
Excursion/Lab Visits/					
Survey/ Industrial Visit					
Total	25		75		
Any remarks/ Suggestions: Nil					

	Part A- Introduction				
Program	Certificate	Class:	First Y	ear	Session 2021-22
		B.Sc.			
		Subject: Mi	crobiolog	gy	
1.	Course Code	S1-MBIO2T			
2.	Course Title	Microbial Te	echnique	s (Pa	per II)
3.	Course Type	Core Course			
4.	Pre-requisition	To study this course a student must have had the subject Biology in class 12^{th} .			
5.	Course Learning Outcomes (CLO)	After complete shall understate • Recal labora • Summisolati • Under instrut • Apply • Practi labora • Illustry positiv	 Biology in class 12th. After completing this course in Microbiology, a student shall understand- 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	Max. Marks:	25+75	I	Min. Passing Marks:33

	Part B- Content of the Course	
Total No	. of Lectures- 60	
Lectures-	tutorials-Practical (in hours per week): L-T-P:4-0-0	
Unit	Topics	No. of Lectures
1.	 Microscopy and staining 1.1.Microscopy - Principles and applications of simple and compound Bright-field microscopy, Dark-field microscopy, Fluorescence 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 smear 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 words: Microscopy, Light microscope, Wet mount, Hanging drop method, Bacterial staining. 	15
2.	InstrumentsElectronic Balance, Autoclave, Centrifuge, Colony counter, Deepfreezer, Homogenizer, Hot air Oven, Incubator, Laminar air flow,Magnetic stirrer, pH Meter, Spectrophotometer, Vortex mixture, Waterbath, Water distiller, Chromatography Chambers, Anaerobic chamber,and Electrophoresis apparatus.Key words: Instruments in microbiology laboratory.	15
3.	 Sterilization and Culture Medium 3.1. Physical methods of sterilization - Dry heat, Moist heat, Radiation, Filtration, and Incineration. 3.2. Chemical methods of sterilization - Phenol and phenolic compounds, Alcohol, Halogens and Detergents. 3.3. Types of culture media -Natural, synthetic, complex, enriched, and selective. Anaerobic (Thioglycolate broth, Robertson's media, Microaerophilic), broth culture of aerobic bacteria. Key words: Physical sterilization, Chemical sterilization, Microbial culture media. 	15

Isolation, Cultivation and Preservation	15
4.1.Natural microbial population - Pure culture.	
4.2. Isolation of microbial population- From air, water, and soil.	
4.3. Methods for isolation - Streak plate, pour plate and Spread plate. Serial dilution and Micromanipulator methods. Cultivation on liquid and solid media. Isolation of microorganisms on potato slice and bread.	
4.4. Maintenance and preservation for short term and long term.	
4.5. Cultivation of anaerobic bacteria and accessing non- cultivable microorganisms.	
Key words : <i>Pure culture, Isolation of microbes, Preservation of culture</i>	
	 Isolation, Cultivation and Preservation A.1.Natural microbial population- Pure culture. 4.2.Isolation of microbial population- From air, water, and soil. 4.3.Methods for isolation - Streak plate, pour plate and Spread plate. Serial dilution and Micromanipulator methods. Cultivation on liquid and solid media. Isolation of microorganisms on potato slice and bread. 4.4.Maintenance and preservation for short term and long term. 4.5.Cultivation of anaerobic bacteria and accessing non- cultivable microorganisms. Key words: Pure culture, Isolation of microbes, Preservation of culture

	Part C- Learning Resources
	Textbooks, Reference Books and Other Resources
Sugge	sted Readings:
1.	Pelezar, M.J., Chan, E.C.S. and Krieg, N.R., "Microbiology". Tata McGraw-Hill,
	NewDelhi. (2001).
2.	Tortora G.J., Funke B.R., and Case C.L., "Microbiology: An Introduction." 9th edition
	Pearson Education. (2008).
3.	Willey J.M., Sherwood L.M., and Woolverton C.J., "Prescott's Microbiology". 9th
	edition. McGraw Hill Higher Education. (2013).
4.	Madigan, M.T., Martinko, J.M., Dunlap, P.V. and Clark D.P., "Brock Biology of
	Microorganisms, 12' Edition. Pearson Benjamin Cummings, San Francisco. (2009).
5.	Sumbali, Geeta and Mehrotra, R.S., "Principles of Microbiology". McGraw Hill
	Edition. (2017).
6.	Ananthanarayana, R., and Panicker, C.K.S., "Textbook of Microbiology", 6" Edition.
	Oriental Longman Publications, USA. (2000).
7.	Dubey, R.C. and Maheshwari, D.K., "A Textbook of Microbiology". S. Chand
	&Company Ltd., New Delhi. (2008).
8.	Sharma, P.D. "Microbiology". Rastogi Publications, Meerut. (2014).
9.	Singh, R.P., "Applied Microbiology". Kalyani Publishers, New Delhi. (2007).
10	. Shammi, Q.J., "Microbiology-I'. Kailash Pustak Sadan, Bhopal. ISBN: 978-81-89900-
	43-4.1.
11	. Shammi, Q.J. and Uike, J., "Cell Biology and Immunology". Kailash Pustak Sadan,
	Bhopal. ISBN: 978-81-89900-95-3.
Sugge	sted Equivalent online courses:
1.	https://www.mooc-list.com/course/small-and-mighty-introduction-microbiology-
-	futurelearn
2.	https://www.mooc-list.com/course/microbiology-saylororg.
3.	https://www.mooc-list.com/course/bacteria-and-chronic-infections-coursera
4.	https://www.coursera.org/lecture/bacterial-infections/1-1-introduction-to-bacteria-
_	by-bioinformatician-phd-peder-worning-HZ64
5.	https://openstax.org/books/microbiology/pages/1-3-types-of-microorganisms
6.	https://openstax.org/books/microbiology/pages/4-1-prokaryote-habitats-relationships-

<u>and-</u> microbiomes
<u>https://swayam.gov.in/explorer?searchText-microbiology</u>

Part D- Assessment and Evaluation							
Suggested Continuous Evalua	ation Methods:						
Maximum Marks:	Maximum Marks: 100						
Continuous Comprehensive Ev	raluation (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: Nil				

	Part A- Introduction				
Program	Certificate	Class:	First Ye	ear	Session 2021-22
		B.Sc.			
		Subject: Mi	crobiolog	у	
1.	Course Code	S1-MBIO2P			
2.	Course Title	Microbial To	ols and Te	echn	iques (Paper 2)
3.	Course Type	Core Course			
4.	Pre-requisition	To study this	course a s	stude	ent must have had the subject
		Biology in cla	ass 12^{th} .		
5.	Course	On completio	on of this c	cours	e, learners will be able to
	Learning understand:				
	Outcomes (CLO)	 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 			
6	Credit Value	metho	ous.		
0. 7	Total Marks	May Markey 25+75 Min Dessing Markey 23			
1.	I Utal Walks	IVIAX. IVIALKS.	43+13	Γ	viiii. 1 assilig ivialks.33

	Part B- Content of Practical Course	
Total No.	of Lectures-30	
Tutorials-	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	4
	working of basic instruments.	
2.	Basic media preparation technique, autoclaving,	6
	cleaning, and sterilization of glassware.	
3.	Preparation of liquid culture media - Peptone water,	2

	nutrient broth.	
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
6.	Isolation of fungi from water, soil, and air by serial dilution agar plating method.	3
7.	Isolation of microorganisms by pour plate method.	3
8.	Isolation of microorganisms by streak plate method	3
9.	Isolation of microorganisms by spread plate method	3
10.	Any other experiment may be designed on the basis of theoretical aspects	1
Key wor	ds: Basic instruments. Culture media, pour plate. Streak pla	ite Spread plate

Part C- Learning

Textbooks, Reference Books and Other Resources

Resources

- 1. Cappuccino, J and Sherman, N., "Microbiology: A Laboratory Manual", 9th edition. Pearson Education Limited. (2010).
- 2. Dubey, R.C. and Maheswari, D.K., "Practical Microbiology", S. Chand & Co. Ltd., New Delhi. (2002).
- 3. M. Gopal Reddy, M., Reddy, M.N., Saigopal, D.V.R. and Mallaiah K.V., "Laboratory Experiments in Microbiology". Himalaya Publishing House, Mumbai. (2007).
- 4. Aneja, K.R., "Laboratory Manual of Microbiology and Biotechnology. 2" Edition", Meditech Scientific International. (2018).
- 5. Patel, Rakesh J. and Patel Kiran, R., "Experimental Microbiology Vol. I and Vol. II",. Aditya Prakashan, Ahmadabad. (2009).
- 6. Varghese, Naveena and Joy, V, "Microbiology Laboratory Manual' Ed.1, Aromatic and Medicinal Plants Research Station, Odakkali, Ernakulam, Kerala. (2014).
- 7. Shammi, Q.J. "Microbiology Tools and Techniques", Kailash Pustak Sadan, Bhopal. ISBN: 978-81-89900-38-0 (In Hindi also).
- 8. Grainger. John, Hurst. Janet and Burdass. Dariel, "Basic Practical Microbiology: A Manual". The Society for General Microbiology. (2001).

Suggested Digital Platforms/Web Links:

1. https://www.mooc-list.com/course/introduction-practical-microbiology-futurelearn

2. https://study.com/articles/List_of_Free_Online_Microbiology_Courses_and_Training_Options. html.

Part D- Assessment and Evaluation

Suggested 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	10	Table	50
(Charts/Model/Seminar/Rural		work/Experiments	

Service/Technology		
Dissemination/Report of		
Excursion/Lab Visits/		
Survey/ Industrial Visit)		
Total	25	75
Any remarks/ Suggestions: Ni	1	

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 Microbiology	
Subject: Chemistry (Minor/Elective)	

Program Certificate		Class:	First Year	Session 2021-22		
		B.Sc.				
	Subject: Chemistry					
1.	Course Code	S1-CHEM2	Γ			
2.	Course Title	Analytical C	hemistry (Pa	per II)		
3.	Course Type	Core Course				
4.	Pre-requisition	To study this Chemistry in	course a stude class 12 th or e	ent must have had the subject quivalent		
5.	Course Learning Outcomes (CLO)	 Chemistry in class 12th or equivalent By the end of this course students will learn the following aspects of Chemistry: Basic concepts of Mathematics for Chemists. Fundamentals of Analytical Chemistry and steps involved in analysis. Basic knowledge of Computer for chemists. Basic concepts of Chemical equilibrium. Principles of Chromatography and chromatographic techniques. 				
6.	Credit Value	4				
7.	Total Marks	Maximum M 25, University Ex	arks: CCE- xam (UE)-75	Min. Passing Marks: 33		

	Part B- Content of the Course	
Total No	. of Lectures-Tutorials-Practical (In hours per week):	
L-T-P:	90-0-30	N 7 O
Unit	Topics	No. of
1	Mathematics for Chamista	Lectures 10
1.	Straight line equation Logarithmic relations. Curve sketching Linear	10
	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 ligures, statistical terms: mean, mean deviation, median,	
	standard deviation, Numerical Froblems.	
	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, Chamical stoichiomatry	
3	Computer for Chemists	10
5.	Introduction to computer. Introduction to operating systems like -DOS	10
	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.	10
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.	
	Keywords/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 Layer Chromatography (TLC) and Column	
	Chromatography (CC), Gas Chromatography (GC) and High	
	Pressure Liquid Chromatography (HPLC), types of column and	
	column selection, applications, limitations.	
	Principle and Applications of:	
	Flash chromatography.	
	 Ion-exchange chromatography and 	
	Chiral chromatography.	
	Keywords/Tags Chromatogram, Ion Exchange, Column Selection,	
	Adsorption	
6.	Spectral techniques of analysis	10
	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: <i>Hypsochromic, Hypochromic, Absorption, Spectrum</i>	

Resources

Part C- Learning

Textbooks, Reference Books and OtherResources

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

Web sources

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

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods:Continuous Internal EvaluationMarksshall be based on Allotted Assignment and Class Tests.The marks shall be as

follows:	
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	I
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.	Course Title	Analytical P	rocesses and '	Techniques (Paper II)		
3.	Course Type	Core Course				
4.	Course	By the end of	this course st	udents 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. Identi	fication of Org	ganic compounds by		
		chron	natographic teo	chniques.		
		5. Analysis of Spectral Techniques.				
5.	Credit Value	2				
6.	Total Marks	Maximum Marks: CCE- 25, University Exem (UE) 75				
		University Exam (UE)-75				

	External Assessment	Marks
	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.	Quantitative Analysis	20
	 Titrimetric Analysis Standardization of NaOH with Oxalic acid. Determination of carbonate and hydroxide present in mixture. Determination of carbonate and bicarbonate present in a mixture. Determination of free alkali present in different soaps/detergents. 	
3.	Quantitative Analysis by Colorimetry	10
	• Verification of Lambert-Beer Law.	
	• Determination of concentration of colored compounds (e.g.,	
4	CuSO4. KMnO4)	
4.	 Quantative Analysis Systematic identification of organic compounds by qualitative analysis. Chromatography: 	
	Identification by determination of the Revalues of the given organic/ inorganic compounds by paper / thin layer chromatography. Keywords/Tags: Analytical, Authentication, Molarity/ Normality, Standardization, Colorimetry, Qualitative Analysis	

Part C- Learning Resources

Textbooks, Reference Books and Other Resources

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. <u>https://www.youtube.com/watch?v=0AlmRDzuTh8</u>.
- 2. <u>http://amrita.olabs.edu.in/?sub=73&brch=8&sim=133&cnt=1</u>.
- 3. <u>http://chemcollective.org/vlabs</u>.
- 4. http://mas-jith.vlabs.ac.in/exp6/Quiz.html
- <u>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).</u>
- 6. <u>https://edu.rsc.org/experiments/leaf-chromatography/389.article</u>.
- 7. <u>https://edu.rsc.org/experiments/chromatography-of-</u> sweets/455.article.
- 8. <u>http://swe.mit.edu/outreach/virtual_resources/paper_chromatog</u> raphy.pdf.
- 9. http://www.chem.latech.edu/~deddy/chem104/104Standard.html.
- 10. <u>https://www.chem.purdue.edu/courses/chm224/Miscellaneous/</u> Model_report_Expt2-revised 2009.pdf.
- 11. https://www.webpages.uidaho.edu/ifcheng/Chem%20253/labs/ Experiment%203.pdf.
- 12. <u>http://faculty.ccbemd.edu/~cyau/122%2007%20Acid-</u> base%20titration%20AUG%202013.p df.
- 13. https://labbalances.net/blogs/blog/guide-to-calibration weights.
- 14. <u>https://cdn2.hubspot.net/hubfs/2203666/Beamex_White_Papers</u>/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	
 Class Interaction on- Common glassware and lab wares for solution preparation and analysis. Numerical problems related to solution preparation. Any other discussion. <i>Note: description to be written in practical record.</i> 	10	<i>Viva voce</i> on Practical	15	
Attendance	5	Practical Record File	10	
Assignments	10	Table	50	
(Charts/Model/Seminar/Rural		work/Experiments		
Service/Technology Dissemination/Report				
of Excursion/Lab Visits/ Survey/				
Industrial Visit)				
Total	25		75	

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B.Sc. I Year Microbiology Biotechnology (Elective)

Part A- Introduction						
Program	Certificate	Class:	First Y	ear	Session 2021-22	
		B.Sc.				
	Subject: Microbiology (Biotechnology elective)					
1.	Course Code	CORE-TH-2	SIBTEC	C2T		
2.	Course Title	Microbiology	y and im	mun	ology	
3.	Course Type	Core Course	Core Course			
4.	Pre-requisition	To study this	course a	stude	ent must have had the subject	
		Biology in cla	ass 12^{th} .			
5.	Course	Course Obje	ctives: T	lo cre	eate general understanding about	
	Learning	microbiology	and imm	nunol	ogy	
	Outcomes					
	(CLO)	1. The students will be able to understand microbial				
		diversity and Nutrition.				
		2. The students will be able to understand immune				
		system, Immune responses, and Vaccination.				
		3. The students will be able to describe role of immune				
		system in both maintaining health and contributing to disease				
		4. The st	udents w	ill be	e able to understand immunological	
		techni	ques.			
		Course Lear	ning Ou	tcom	es: At the end of the course student	
		will be famili	ar with –	-		
		1. Micro	bial dive	rsity	and nutrition.	
		2. Immu	ne syster	n, its	properties, and types.	
		3. Immu	noglobul	in str	ructure, types and functions and can	
		apply the concept of hypersensitivity and vaccination				
		for different diseases.				
		4. Perform various immunological techniques.				
6	Credit Value	4				
7.	Total Marks	Max. Marks:	Max Marks: 25+75 Min Passing Marks: 33			

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			
	Key Words : Classification of Microorganisms, Media Preparation.			
Π	Microbial Growth and Growth measurement:	14		
	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),						
	Pollo, 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 th edition.				
Sugge	Suggested 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				

Part D- Assessment and Evaluation							
Suggested Continuous Evaluation Methods:							
Maximum Marks:	Maximum Marks: 100						
Continuous Comprehensive Ev	aluation (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					
	Ouestions (500 Words Each)						

	Total	75		
Any remarks/suggestions: Nil				

	Part A- Introduction				
Program	Certificate	Class:	First Ye	ar	Session 2021-22
		B.Sc.			
		Subject: Mi	crobiolog	y ele	ective practical
1.	Course Code	CORE-PR-2	CORE-PR-2-SI-BTEC2P		
2.	Course Title	Lab on Micro	biology a	nd I	mmunology
3.	Course Type	Core Course			
4.	Pre-requisition	To study this Biology in cla	course a s ass 12^{th} .	tude	ent must have had the subject
5.	Course	The objective	e of the co	ours	e is to prepare students competent
	Learning Outcomes (CLO)	 in subject through in-depth lecture and laboratory practices- 1. The students will be able to identify microbes using modern techniques. 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. Course Learning Outcomes: On completion of this course, learners will be able to have sufficient scientific understanding of microbiology and immunology- 			
		 Students can apply concept, principle and types of sterilization methods viz performing microbiological experiments. Students can apply the concept and characteristics of antiseptic. disinfected and their mode of action in day- to-day life. Students will apply principle, working and applications of instruments - Laminar airflow, Autoclave, Hot air oven etc. 			
6.	Credit Value	2			
7.	Total Marks	Max. Marks: 25+75 Min. Passing Marks: 33			

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 rand viable count.					
8. To study Antibiotic sensitivity of inicrobes by the use of					
0 To isolate and identify nathogenic bacteria from sewage					
and wastewater					
10 To Determine growth curve and generation time of F 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.					

Resources

Part C- Learning

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 D- Assessment and Evaluation

Suggested 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	10	Table	50		
(Charts/Model/Seminar/Rural		work/Experiments			
Service/Technology					
Dissemination/Report of					
Excursion/Lab Visits/					
Survey/ Industrial Visit)					
Total	25		75		
Any remarks/ Suggestions: Nil					
Scheme of table work/Experime	ents				
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			

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B.Sc. I Year B.Sc. I Year (Microbiology) Subject: English Language and Indian Culture (Foundation)

	PART A: 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 (Con	re	Foundation Cour	se	
	Course/Elective/G	ener			
	Pre-Requisite (if		To study this con	rsa a student should have	
-т.	Tre-Requisite (if a	(IIY)	basic knowledge.	inse, a student si	
			of English langu	age. This cours	e will be
			studied by all the	estudents of UG	level under
	~		the Foundation C	ourse category.	
5. Course Learning Thro			Through this cour	se the students v	vill be able to:
	Outcomes(CLO)		developing the	irEnglish langua	oe
			competence.		50
			2. Promote their comprehension skills by		
			being exposed	to avariety of tex	kts and
			their interpreta	tions.	
			3. Build and enl	nance their voc	abulary.
			4. Develop them	•	alvilla by
			strengtheningg	u rammar and usad	SKIIIS UY
			5 Inculcate values which make them		
			aware of natio	onalheritage and	
			environmental	issues, making	them

			responsible citizens.	•	
6.		Credit Value	2		
7.		Total Marks	Max. Marks: 50		Min. Pass Marks:17
		PART B: Co	ontent of the	I	
Total	No. of L	Lectures-Tutorials- Practical (in ho	ours per week): L-T-P		
		Total No. o	f Lectures:		
Unit		Topics		Ν	o. of Lectures
Ι	Readi	ng, Writing and Interpretation S	Skills:		
	I. Whe	re the Mind is Without Fear—Rab	oindranath Tagore [Key)5	
	Word	: Patriotism]	Word.	,5	
	2. Nati	onal Education — M. K. Gandni fication	[Key word:		
	3 The	Axe- R K Narayan [Key Word·	Environment]		
	4. The	Wonder That Was India- A.L Ba	sham (an excerpt)		
	[Key	y Word: Indianness]			
	5. Pref	ace to the Mahabharata C. Rajago	opalachari [Key		
TT	Wol	rd: Indian Mythology]			
11	Unsee	n Passage followed by Multiple ch	noice questions)5	
III	Basic	Language Skills 1: Vocabulary B	uilding: Suffix, Prefix,		
	Synon	yms, Antonyms, Homophones, Ho	omonyms and One-)5	
	word s	substitution.			
	2: Bas	ic Grammar: Noun, Pronoun, Adje	ective, Verb, Adverb,		
	Prepos	PART C. Lear	ning Resources		
		Textbooks. Refer	ence Books. Other		
		Reso	ources		
Sugge	ested Rea	dings			
Esse	ntial Eng	glish Grammar - Raymond Murphy,	, Cambridge University P	ress	S.
• Prac	ctical En	glish Usage - Michael Swan, Oxfo	nomson & A. V. Martine rd	et, C	oxiora india.
- 1140		Suge - Michael Swall, OAIO	14		

• 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 Multiple Choice				
/Objective/True-False type				
questionsto be asked. Each				
question carries one mark				

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B.Sc. I Year (Microbiology) 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 create awareness about the life of human beings which is an integral part of the environment; and to inculcate the skills required to protect the environment from all sides. To study this course, the student must have knowledge about the environmental components, pollution, biodiversity, and ecosystem at senior secondary_class 12 th				

		level:	
5.	Course Learning Outcomes (CLO)	1.	To understand various aspects of life
			forms, ecological processes, and the
			impacts on them by the human during
			Anthropocene era.
		2.	To build capabilities to identify
			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
		4	preservation.
		4.	To develop the critical thinking for
			social, economic, administrative &
			legal, environmental protection,
			conservation of biodiversity,
			environmental equity, and sustainable
		5	development.
6	Credit Value	3. 2	To prepare for the competitive exams.
0.			M
7.	Max Marks: 50	Min. Pa	ass Marks:1/

		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	Environment and Natural Resources:					
	• Multidisciplinary nature, Scope, and Importance of					
	Environment	5 Hrs				
	Components of Environment: Atmosphere,	5 1115.				
	Hydrosphere, Lithosphere, and Biosphere.					
	Brief account of Natural Resources and associated					
	problems: Land Resource, Water Resource, Energy					
	Resource					
	• Concept of Sustainability and Sustainable Development Knowerds: Environment Forest Mineral Food Land Water Energy					
	SustainableDevelonment					
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					
111	Environmental Pollution, Management and Social Issues:					
	• Pollution: Types, Control measures, Management, and					
	 Environmental I aw and Legislation: Protection and 	6 Hrs.				
	conservation Acts.	0 1115.				
	• International Agreement & Programme.					
	• Environmental Movements, communication, and public					
	awareness programme.					
	conservation and					
	monitoring.					
	• Role of information technology in environment and human					
	health.					
	Keywords: 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) 2nd 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), 6th 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. The Health Effects of Climate Change (edx)
- ii. Climate Change: Financial Risks and Opportunities (edx)
- iii. Introduction to Environmental Law and Policy (coursera)
- iv. Women in environmental biology (coursera)
- v. Our Earth: It's Climate, History, and Processes (coursera)
- vi. Ecology, physiology, environmental science (national digital library)

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 Microbiology Subject: Yoga and Meditation (Foundation Part-A: Introduction

Program: Certificate course	Class: B.A. 1 Year	Year: 2021	Session: 2021 — 2022

		Subjec	et: Yogic Science			
	I.	Course Code	Al-YOSC1F			
2	•	Course Title	Yoga and Meditation (Paper-2)			
3	•	Course Type	Foundation Course	Foundation Course		
4	•	Pre-requisite (If any)	For BA I Year students, this course is compulsory for			
			all.			
5	•	Course Learning Outcomes	After studying this cours	se, students will be able to	:	
Take care of their own Physical Mental emo		Physical Mental emotiona	ıl,			
			social, and spiritual hea	lth.		
(5:	Credit Value	Theory-2			
,	7.	Total Marks	Max. Marks: 50	Min. Passing Marks: 17		
		·				
		Part-B: Co Total numbers of Lecture	ntent of the Course	hours ner week		
		Total Lectures:	30 hours; L - T - P: 2 - 0	0—0		
Unit			Topics	No). of	
S				Le s	cture	
Ι		Introd and V	uction to Yoga		10	
	1 37		ogic Fractices			
	1. Yo	ga: Etymology, definitions, aim, o	objectives, and misconce	ptions		
	2. Yo	ga: Its Origin, history, and develo	pment			
	3. Ru	les and regulations to be followed	by Yoga Practitioners			
	4. Int	roduction to Yoga practices				
	5. Sh	atkarma: meaning, purpose and th	eir significance in Yoga Sa	adhana		
	6. Int	roduction to Yogic Loosening pra	ctices and Surya Namaska	r Key Words:		
	History	and Development of Yoga, Shatk	arma, Common Yogic Pra	ctices.		
II	Breath 1.	ing Practices and Pranayama Sectional Breathing (Abdominal, Clavicular)	Thoracic and		10	
	2.	Yogic Deep Breathing				
	3.	Concept of Puraka, Rechaka and	Kumbhaka			
	4.	Concept of Bandha and Mudra	a			
5. Anulmoa Viloma/Nadi Shodhana						

	6. Shitali	
	7. Bhramari	
	Key Words: Sectional breathing, Deep breathing, Bandha &	
	Mudra,Shitali, Bhramari	
III	Practices leading to Meditation.	10
	1. Recitation of Pranava Mantra	
	2. Recitation of Hymns, in vocations and prayers	
	3. Anter Maun	
	4. Breath Meditation	
	5. Om Dhyana	
	Keywords 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.		
Suggest	ive digital platforms web links:		
1	www.rishikeshnathyogshala.com		
Suggest	ive equivalent online Courses		
Suggest	ive equivalent online Courses-		
1. 1	1. Liatps://sahaNdi.com/hathayoga-course		
2. 1	https://theyogainstitute.org/		

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