

GANPAT UNIVERSITY

Faculty of Science

Teaching and Examination scheme

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Syllabus of

B.Sc. Microbiology

Semester IV

Effective from July-2019

GANPAT UNIVERSITY

FACULTY OF SCIENCE

TEACHING AND EXAMINATION SCHEME

Programme		Bachelor of Science		Branch/Spec.	Microbiology															
Semester		IV																		
Effective from Academic Year				2019-20		Effective for the batch Admitted in										July-2018				
Sr. No.	Subject Code	Subject Name	Teaching scheme												Examination scheme (Marks)					
			Credit						Hours (per week)						Theory			Practical		
			Lecture(DT)			Practical(Lab.)			Lecture(DT)			Practical(Lab.)			CE	SEE	Total	CE	SEE	Total
			L	TU	Total	P	TW	Total	L	TU	Total	P	TW	Total						
1	BMIC4FDM	Food and Dairy Microbiology	3	--	3	2	2	3	--	3	3	1	4	40	60	100	40	60	100	
2	BMIC4SWM	Soil and Water Microbiology	3	--	3	2	2	3	--	3	3	1	4	40	60	100	40	60	100	
3	BCHE4IPC	Inorganic and Physical Chemistry-II	3	--	3	2	2	3	--	3	3	1	4	40	60	100	40	60	100	
4	BCHE4OAC	Organic and Analytical Chemistry-II	3	--	3	2	2	3	--	3	3	1	4	40	60	100	40	60	100	
5		Elective*	2	--	2	--	--	2	--	2	--	--	--	40	60	100	--	--	--	
Total			14	--	14	08	08	14	--	14	12	04	16	200	300	500	160	240	400	

*any one subject can be offered from the following list of elective subjects.

Elective

Sr. No.	Subject Code	Subject Name
1	BELE4SCW	Scientific Writing
2	BELE4BPT	Basic Probability Theory
3	BELE4DMT	Disaster Management-II
4	MOOCs courses from SWAYAM PORTAL	

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Bachelor of Science			Branch/Spec.	Microbiology				
Semester	IV			Version	2.0.0.0				
Effective from Academic Year	2019-20			Effective for the batch Admitted in	July-2018				
Subject code	BMIC4FDM	Subject Name	Food and Dairy Microbiology						
Teaching scheme				Examination scheme (Marks)					
(Per week)	Lecture(DT)		Practical(Lab)		Total	CE	SEE	Total	
	L	TU	P	TW					
Credit	03	--	02		05	Theory	40	60	100
Hours	03	--	03	01	07	Practical	40	60	100

Pre-requisites:

Students should have knowledge of basic Microbiology

Learning Outcome:

The course will help the student to understand of role of microorganisms in fermented foods and food spoilage. It also gives knowledge of methods for food preservation and enumeration of microbes.

Theory syllabus

Unit	Content	Hrs
1	<p>Microbiology of Food and Food Bourne Ailments:</p> <ul style="list-style-type: none"> – Food as a substrate for microorganisms. Microbial flora of foods: Milk, fruits, vegetables, meat and eggs. – Intrinsic and extrinsic factors affecting kinds and numbers of microorganisms. – Food borne diseases: <ul style="list-style-type: none"> • Sources of contamination of food and milk. • Food and milk infections: Salmonellosis; Shigellosis; Infections due to <i>Bacillus cereus</i>, <i>Vibrio parahaemolyticus</i>, <i>Escherichia coli</i>, <i>Yersinia enterocolitica</i>, <i>Listeria monocytogenes</i> and <i>Campylobacter jejuni</i>. • Food poisoning: Role of <i>Staphylococcus aureus</i>, <i>Clostridium botulinum</i> and <i>Salmonella</i> spp. – Molds as poisoning agents. 	12
2	<p>Microbial Food Spoilage and Preservation:</p> <ul style="list-style-type: none"> – Microbial spoilage of food: Causes of spoilage. Biochemical changes due to microbes. Spoilage of milk and milk products, fruits, vegetables, eggs and meat. Spoilage of canned foods. – Preservation of food and Milk: General principles. – Methods of food preservation: <ul style="list-style-type: none"> • Physical methods: Aseptic handling and Processing, High temperature (Pasteurization, sterilization, canning) Low temperature (Refrigeration and freezing), irradiation (Ionizing and non-ionizing radiation), Osmotic pressure, Dehydration, high voltage pulse, Microwave processing. • Chemical methods: Salt, Sugar, Organic acids, SO₂, Nitrite and nitrates, Ethylene oxide, Antibiotics and Bacteriocins. 	12

	– Hurdle concept.	
3	<p>Application of Microbes in Dairy and Food Industry:</p> <ul style="list-style-type: none"> – Fermented dairy products: Starter culture, Cheese: Types, curdling, processing, ripening. Other fermented dairy products: Yogurt, cultured buttermilk, acidophilus milk, Kefir and cultured sour milk. – Introduction to probiotics, prebiotics and synbiotics, functional foods. – Indian fermented food products: Pickles, Idli, Khaman and Bread. – Microbes as food: Mushrooms, Spirulina and Yeasts. 	11
4	<p>Microbial Methods and Safety in Food Microbiology:</p> <ul style="list-style-type: none"> – Biological methods: Generalized scheme for microbiological examination. Direct microscopic examination, colony forming units (CFU), Most probable number (MPN), Identification of specific group or species of microorganisms. – Analysis of milk: Grading of milk - Resazurin test, MBRT, Phosphatase test. – Food Sanitation and control: HACCP, Indices of food sanitary quality and Sanitizers. 	10
Reference Books		
1	Frazier WC & Westhoff DC (1988). Food Microbiology, 4 th ed., McGraw-Hill, NY.	
2	Adams MR & Moss MO. (2008). Food Microbiology. 3 rd ed., RSC Publishing.	
3	Modi HA (2009). Dairy Microbiology, Aavishkar Publishers, Jaipur.	
4	Willey JM, Sherwood LM & Woolverton CJ (2014). Prescott's Microbiology, 9 th ed., McGraw Hill.	
5	Pelczar Jr. MJ, Chan ECS & Krieg NR (2001). Microbiology. Indian ed., McGraw-Hill.	
6	Modi HA (2007). Introductory Food Microbiology, Aavishkar Publishers, Jaipur.	
List of Practicals		
1	Microbiological analysis of Food: SPC and MPN.	
2	Microbiological analysis of Milk: SPC and MPN.	
3	Determination of microbial load of milk using Resazurin test.	
4	Determination of microbial load of milk using Methylene blue reduction test (MBRT).	
5	Alkaline phosphatase test to check the efficiency of pasteurization of milk.	
6	Isolation of spoilage microorganisms from different food products.	
7	Preparation of Yogurt/Dahi.	

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FACULTY OF SCIENCE									
Programme		Bachelor of Science			Branch/Spec.		Microbiology		
Semester		IV			Version		2.0.0.0		
Effective from Academic Year			2019-20		Effective for the batch Admitted in			July-2018	
Subject code		BMIC4SWM		Subject Name		Soil and Water Microbiology			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	03	--	02		05	Theory	40	60	100
Hours	03	--	03	01	07	Practical	40	60	100
Pre-requisites:									
Students should have knowledge of basic Microbiology.									
Learning Outcome:									
The course will help the student to understand role microbes in soil. In addition, they will gain knowledge about microbiology of drinking water as well as waste water.									
Theory syllabus									
Unit	Content								Hrs
1	Microbiology of Soil: <ul style="list-style-type: none"> – Physicochemical properties of soil. Microbial flora of Soil, Role of microorganisms in soil: Mineralization of organic & Inorganic matter in soil. – Methods of studying soil micro flora: Direct microscopic method, agar plate technique, enrichment culture technique, and buried slide method, Molecular methods for study of soil microorganisms. – Microbial interactions and associations in soil: Neutral, Positive (Symbiosis, Mutualism, Syntrophism, Commensalism, Synergism) and Negative (Antagonism, Competition, Parasitism, Predation) associations. – Interaction between plant roots and microorganisms: Rhizosphere and its significance, Mycorrhiza. 								12
2	Microorganisms as Biogeochemical Agents: <ul style="list-style-type: none"> – Mineralization of Organic and Inorganic Matter in soil. – Rotation of elements in nature: Nitrogen cycle: Proteolysis, ammonification, nitrification, denitrification and nitrogen fixation; Sulfur cycle: Sulfur oxidation and reduction; Carbon cycle: Degradation of complex organic compounds, carbon dioxide fixation; Iron cycle: Iron oxidation and reduction; Phosphorus cycle: Mineralization, immobilization and solubilization of phosphorus. – Soil fertility: Role of microorganisms in soil fertility. 								11
3	Microbiology of Drinking Water <ul style="list-style-type: none"> – Natural waters: Sources of contamination, Microbial indicators of faecal pollution: Coliforms as indicator need for differentiation Methods of differentiation: IMViC test and Elevated temperature test, Microbial indicators other than coliforms. – Nuisance organisms in water: Slime forming bacteria, iron and sulfur bacteria and algae, Water-borne diseases. – Bacteriological examination of drinking water: Sampling, Quantitative analysis: Standard plate count. Qualitative analysis: Multiple tube fermentation method 								11

	(presumptive, confirmed and completed test), MPN, membrane filter technique, defined substrate test, P-A (Presence-Absence) test. – Purification of drinking water: Sedimentation, filtration and disinfection, softening of hard water, use of Reverse Osmosis process.	
4	Microbiology of Wastewater: – Types of wastewater, chemical and microbiological characteristics of waste water. – Methods of wastewater treatment: Primary treatment and secondary treatment. – Principles and role of microorganisms in septic tank, Imhoff tank, trickling filters, activated sludge process, oxidation ponds. Advanced treatment and final treatment. – Solid waste processing: Anaerobic sludge digestion and biogas formation. – BOD, COD and TOC as indicators of strength of wastewater. Pollution problems due to disposal of untreated wastewater.	11
Reference Books		
1	Pelczar Jr. MJ, Chan ECS & Krieg NR (2001). Microbiology. Indian ed., McGraw-Hill.	
2	Modi HA (2013). Soil Microbiology, Aavishkar Publishers, Jaipur.	
3	Dubey RC and Maheshwari DK (2013). Text book of Microbiology. S. Chand Publishers.	
4	Alexander M (1977), Soil Microbiology, 2 nd ed., Krieger Publishing Company.	
5	Agrios GN (2006) Plant Pathology, 5 th ed., Academic press.	
6	Coyne MS (2001). Soil Microbiology: An Exploratory Approach. Delmar Thomson Learning.	
List of Practicals		
1	Study of soil Profile.	
2	Study microflora of different types of soil.	
3	Microbial Examination of Soil.	
4	Microbial Examination of Water.	
5	Qualitative analysis of Soil and water by presumptive, confirmed and completed test.	
6	MPN test for detection of coliforms.	
7	Determination of BOD of water.	
8	Determination of COD of water.	
9	Determination of TOC of water.	

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Programme		B.Sc.			Branch/Spec.		Microbiology		
Semester		IV			Version		2.0.0.0		
Effective From Academic Year			2019-20		Effective for the batch Admitted in			July-2018	
Subject Code		BCHE4IPC		Subject Name		Inorganic and Physical Chemistry-II			
Teaching Scheme					Examination Scheme (Marks)				
Per Week	Lecture		Practical		Total	CE	SEE	Total	
	L	Tu	P	Tw					
Credit	03	--	02		05	Theory	40	60	100
Hours	03	--	03	01	07	Practical	40	60	100
Pre-requisites									
Before studying Chemistry, all students have basic knowledge of chemistry up to 10+2 level, Inorganic, Organic, Physical and Analytical chemistry concepts									
Learning Outcome									
After the successful completion of the course, students will be able to understand									
<ul style="list-style-type: none"> ✓ Basics of Inorganic, Organic, Physical and Analytical chemistry concepts ✓ Ionic solids, organic functional groups, IUPAC, structure of compound. ✓ Chemical kinetics, EMF, order reaction, electrode ✓ Qualitative Analysis, water analysis, TDS, hardness of water 									
Theory Syllabus									
Unit	Content							Hrs	
1	Solid State Types of Solids - Isotropy and Anisotropy - The Habit of a Crystal - Symmetry of Crystals - Miller Indices - How to Find Miller Indices - Crystal Structure - Parameters of the Unit Cells - Cubic Unit Cells - Three Types of Cubic Unit Cells - Calculation of Mass of the Unit Cell - What is Coordination Number of a Crystal Lattice - X-Ray Crystallography - Bragg's Equation - Measurement of Diffraction Angle - Rotating Crystal Method - Powder Method - Ionic Crystals - Sodium Chloride Crystal - Cesium Chloride Crystal - Lattice Energy of an Ionic Crystal - Born-Haber Cycle - Determination of Lattice Energy							15	
2	Noble Gases: Occurrence and uses, rationalization of inertness of noble gases, Clathrates; preparation and properties of XeF ₂ , XeF ₄ and XeF ₆ ; Nature of bonding in noble gas compounds (Valence bond treatment and MO treatment for XeF ₂). Molecular shapes of noble gas compounds (VSEPR theory). Inorganic Polymers: Types of inorganic polymers, comparison with organic polymers, synthesis, structural aspects and applications of silicones and siloxanes. Borazines, silicates and phosphazenes, and polysulphates.							15	
3	Photochemistry Difference between thermal and photochemical processes. Laws of photochemistry Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence. Quantum yield-Photochemical reaction mechanism- hydrogen- chlorine, hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, and Photosensitized reactions- energy transfer processes.							15	

Reference Books

1. Selected topics in Inorganic Chemistry', Wahid U. Malik, G. D. Tuli, R. D. Madan.
2. 'Principles of Inorganic Chemistry', Puri, Sharma and Kalia.
3. 'Advanced Inorganic Chemistry' (Volume-II), Satya Prakash, G. D. Tuli, S. K. Basu & R D Madan.
4. 'Advanced Inorganic chemistry', Gurdeep Raj, Goel Publishing House.
5. 'Shriver and Atkins' Inorganic Chemistry: Atkins, Overton, Rourke, Weller, Armstrong, Oxford University Press.
6. 'Introduction to Quantum Chemistry', A K Chandra, McGraw-Hill.
7. 'Quantum Chemistry', Ira N. Levine, Prentice-Hall International.
8. Physical Chemistry; 9th edition, Atkin P.W. & J. D. Poulas; Oxford University Press, Oxford.
9. Comprehensive Physical Chemistry; B.K.Vermani and S.Kiran Vermani ; Laxmi Publications
10. An Introduction to Electro Chemistry; 10th edition, Samuel Glasstone ; Affiliated East –West Press pvt. Ltd. New Delhi
11. Physical Chemistry; 5th edition; G. M. Barrow, McGraw-Hill, New York.
12. The Elements of Physical Chemistry; 9th edition, Atkin P.W. & J. D. Poulas; Oxford University Press, Oxford.
13. Physical Chemistry through problems; 2nd edition; S.K. Dogra and S.Dogra; New Age International Publishers. University General Chemistry; C.N.R. Rao ; McMillan Publishers
14. Textbook of Physical Chemistry; P.L.Soni , O.P.Dharmarha and U. N. Dash; Sultan Chand & Sons.
15. Basic concepts of analytical chemistry, 3rd edition; S.M.Khopkar; New Age publishers.
16. Analytical chemistry; Dharuba charan das; PHI Pearnig P.L.
17. Advanced Physical Chemistry; 18th edition; J. N. Gurtu and A. Gurtu; Pragati Prakashan.
18. Essentials of Physical Chemistry by Arun Bahl, B.S. Bahl and G. D. Tuli
19. Principles of Physical Chemistry by Puri, Sharma & Pathania
20. Physical Chemistry by P.W. Atkins.
21. Physical Chemistry by R.A. Alberty and R. J. Silbey
22. Physical Chemistry by G.H. Barrow, 5th ed., Mac Graw Hill, 1998.
23. Physical Chemistry by W.J. Moore, 4th ed., Orient Longmans, 1969.

List of Practicals

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|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Volumetric Titrations & Redox Titrations (Minimum 10)
(1) Determination of equivalent weight of carboxylic acid by alkali solution.
(2) Determination of glucose.
(3) Determination of formaldehyde by sodium hypo iodide. |
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Reference Books

1. Textbook of quantitative analysis, A. I. Vogel.
2. Textbook of qualitative analysis, A. I. Vogel.
3. Experimental physical chemistry by R. C. Das & B. Bahera 'Practical in inorganic chemistry & analytical chemistry', H.G. Raval, Nirav&RupalPrakashan.
4. A. I. Vogel, A Text Book of Practical Organic Chemistry.
5. A. Ault, Techniques and Experiments for Organic Chemistry.
6. W. J. Popiel, Laboratory Manual of Physical Chemistry, ELBS, London 1970
7. Findlay's Practical Physical Chemistry, B. P. Levitt, Longman, London, 1985
8. D. P. Shoemaker, C. W. Garland, Experiments in Physical Chemistry, McGraw-Hill. New York,.
9. A.K. De, Environmental Chemistry, New Age publishers, New Delhi, 3, 4 & 5th Edn., 2003.
10. B.K. Sharma and H.Kaur, Environmental Chemistry, Goel Publishing House, Meerut, 3rdEdn, 1996

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	B.Sc.				Branch/Spec.	Microbiology			
Semester	IV				Version	2.0.0.0			
Effective From Academic Year	2019-20				Effective for the batch Admitted in	July-2018			
Subject Code	BCHE4OAC		Subject Name		Organic and analytical Chemistry-II				
Teaching Scheme					Examination Scheme (Marks)				
Per Week	Lecture		Practical		Total	CE	SEE	Total	
	L	Tu	P	Tw					
Credit	03	--	02		05	Theory	40	60	100
Hours	03	--	03	01	07	Practical	40	60	100
Pre-requisites									
Before learning analytical chemistry, student should aware about basic principles and theories of analytical chemistry; Basics of Spectroscopy and organic chemistry UG level chemistry.									
Learning Outcome									
After the successful completion of the course, students will be able to understand									
<ul style="list-style-type: none"> ✓ Basics of organic, bioorganic and biochemistry concepts. ✓ Classification, types and synthesis of Amino acids, Proteins and polypeptides ✓ Applications and synthesis of pharmaceutical compounds and applications of catalyst. ✓ To understand concept and theories of analytical chemistry and get idea about instrumentation techniques. 									
Theory Syllabus									
Unit	Content							Hrs	
1	<p>Vitamins: Introduction, history and nomenclature, classification, synthesis of vitamins by intestinal bacteria, Fat and water soluble vitamins. Biological functions and deficiency of Vitamin-A. Vitamin-C: biochemical functions of Vitamin-C, dietary sources and deficiency symptoms, biomedical/clinical concepts.</p> <p>Amino acids, Proteins and polypeptides Brief Introduction of amino acids, classification of α-amino acids with proper illustrations. Properties of amino acids. General methods for the synthesis of α-amino acids (any two). Introduction of polypeptides and proteins. Comparison of polypeptide and protein.</p>							15	
2	<p>Importance of Pharmaceutical Compounds: Structure and Importance Classification, structure and therapeutic uses of antipyretics: Paracetamol (with synthesis), Analgesics: Ibuprofen (with synthesis), Antimalarials: Chloroquine (with synthesis). An elementary treatment of Antibiotics and detailed study of chloramphenicol, Medicinal values of curcumin (haldi), azadirachtin (neem), vitamin C and antacid (ranitidine).</p> <p>Catalysis: Types of catalyst, specificity and selectivity, mechanisms of catalyzed reactions at solid surfaces; effect of particle size and efficiency of nanoparticles as catalysts. Enzyme catalysis, Michaelis-Menten mechanism, acid-base catalysis.</p>							15	
3	<p>Ultraviolet spectroscopy: Introduction, Principle and instrumentation. Various spectral regions of electromagnetic spectrum in terms of frequency and wave number,, Frank Condon principle, Electronic excitation, Simple chromophoric groups, oxochromic groups, Conjugated systems, systems of extended conjugation, aromatic systems, Red and blue shifts, Hyperchromic and Hypsochromic effects, Woodward, Fiesher Scott rules for pre-designing of organic functional groups viz conjugated dienes, unsaturated carbonyl compounds, aromatic compounds.</p>							15	

Reference Books

1. Instrumental methods of chemical analysis; 5th edition, Ewing G. W.; McGraw Hill Higher Education.
2. Instrumental analysis; 2nd edition, Chritian G.D. and O'Reilly J.E.; Allyn & Bacon, USA
3. Introduction to Spectroscopy; 4nd edition, Pavia, Lampman, Kriz & Vyvyan; Cengage Learning, USA
4. Spectrometric identification of organic compounds; 7th edition, Silverstein, Webster & Kiemle; John Wiley & Sons, INC
5. Elementary organic Spectroscopy; Revised edition, Y. R. Sharma; S. Chand & Company Pvt.Ltd.
6. Spectroscopy of organic compounds; 6th edition, P. S. Kalsi; New Age International Publishers
7. Spectroscopy, 12th edition, B K Sharma; Goel Publishing House, Meerut.
8. 'Analytical chemistry', R. Gopalan, S. Chand and Co., New Delhi.
9. 'Introduction to Chromatography: Theory and Practice', V.K. Srivastava and K.K. Srivastava, S. Chand and company, New Delhi.
10. 'Modern Experimental Organic Chemistry', R. M. Roberts, J. C. Gilbert, L. B. Rodewald, and A. S. Wingrove, Holt Saunders international editions.
11. 'Chemical Analysis: An Instrumental Approach for B.Sc. Hons. and M.Sc. Classes', A. K. Srivastava and P. C. Jain, S. Chand and company Ltd., Ram Nagar, New Delhi.
12. Organic Chemistry, The fundamental principles', I. L. Finar. Pearson.
13. 'Organic Chemistry, Stereocheistry and the chemistry Natural Products', I. L. Finar, Pearson.
14. 'Organic Chemistry', S. M. Mukherji, S. P. Singh and R. P. Kapoor, New Age International (P) Limited.
15. 'A textbook of organic chemistry', Arun Bahl, B. S. Bahl, S. Chand.
16. 'Organic Chemistry', Robert Thornton Morrison and Robert Neilson Boyd, Prentice-Hall of India Private Limited.
17. 'March's Advanced Organic Chemistry Reactions, Mechanism and Structure', Michael B Smith and Jerry March, Wiley.
18. 'Reaction Mechanisms and Reagents in Organic Chemistry', Gurudeep R. Chatwal,
19. 'Organic chemistry, reaction mechanism', V. K. Ahluvalia, R. K. Parashar, Narosa.

List of Practicals

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|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <p>Binary Organic Mixture: [Solid + Solid or Solid + liquid i.e. (acetone, methyl acetate, ethanol, benzene, CCl₄)].</p> <ul style="list-style-type: none">• Determination of melting and boiling points of organic substances for two sessions.• Organic analysis: Identification of acidic, basic, phenolic, and neutral organic substances.• Detection of N, S and halogens, Test for aliphatic and aromatic nature of substances.• Test for saturation and unsaturation.• Identification of functional groups: i) Carboxylic acids ii) Phenols iii) Aldehydes iv) Ketones v) Esters vi) Carbohydrates vii) Amines viii) Amides ix) Halogen compounds. <p>Preparation of derivatives for the functional groups.</p> |
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Reference Books

1. Textbook of quantitative analysis, A. I. Vogel.
2. Textbook of qualitative analysis, A. I. Vogel.
3. Experimental physical chemistry by R. C. Das & B. Bahera 'Practical in inorganic chemistry & analytical chemistry', H.G. Raval, Nirav&RupalPrakashan.
4. A. I. Vogel, A Text Book of Practical Organic Chemistry.
5. A. Ault, Techniques and Experiments for Organic Chemistry.
6. N. K. Vishnoi, Advanced Practical Organic Chemistry.
7. B. B. Dey and M.V. Sitaraman, Laboratory Manual of Organic Chemistry.

8. Raj K. Bansal, Laboratory Manual in Organic Chemistry.
9. W. J. Popiel, Laboratory Manual of Physical Chemistry, ELBS, London 1970
10. Findlay's Practical Physical Chemistry, B. P. Levitt, Longman, London, 1985
11. D. P. Shoemaker, C. W. Garland, Experiments in Physical Chemistry, McGraw-Hill, New York, .
12. A.K. De, Environmental Chemistry, New Age publishers, New Delhi, 3, 4 & 5th Edn., 2003.
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FACULTY OF SCIENCE									
Programme	Bachelor of Science				Branch/Spec.	Microbiology			
Semester	IV				Version	2.0.0.0			
Effective from Academic Year		2019-20			Effective for the batch Admitted in			July-2018	
Subject code	BELE4SCW	Subject Name			Scientific Writing				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	02	--	--	--	02	Theory	40	60	100
Hours	02	--	--	--	02	Practical	--	--	----
Pre-requisites:									
Familiarity with basics of English language, strong determination and will-power for skill-set enhancement.									
Learning Outcomes:									
At the end of the course, the students shall acquire satisfactory competency in the fundamental communication skills so as to be able to:									
<ul style="list-style-type: none"> • listen, understand and respond effectively • read, comprehend and apply the acquired knowledge/information in various practical situations • speak efficiently under various conditions • write various drafts in clear and concise manner 									
Theory syllabus									
Unit	Content								Hrs
1	Preparing for a Career: Job Application with a Resume: Identifying job openings Applying for a job, Preparing Cover letters, Types of a Resume, Preparing a CV/Resume								08
2	Learn to Correspond: Synthesis of Sentences, Punctuations to successful writing, Paragraph Development: using transitional tags, observing unity and adequate development of paragraph, Interview Call Letter, Joining Letter, Letter of Promotion, Resignation Letter, Letter of Recommendation, and Circulars								07
3	Writing for Competition: Précis Writing: Fundamentals of Précis, Précis of Select Unknown Paragraphs. Summarizing a Given Text, Note-making and Note-taking Information Transfer: Describing a picture, Chart, Graph, or Object, Idioms and Phrases, Reordering the sentence, Comprehension								08
4	Professional Writing Skills : Business Letters: Inquiry, Reply, Order, Complaint, Adjustment and Sales Letters, Scientific Proposals, Scientific/Technical Reports, Scientific Papers								07
Reference Books									
1	Technical Communication - Principles and Practice by Meenaksi Raman & Sangeeta Sharma (Oxford University Press)								
2	Communication Skills by Sanjay Kumar and Pushp Lata (Oxford University Press)								
3	Effective Technical Communication by M Ashraf Rizvi (TMH Publication)								
4	A Communicative Grammar of English by Geoffery Leech and Fan Svartvik (Pearson Longman)								
5	Online resources: You Tube - Daily Video Vocabulary, Vocab 24, TED Lectures, Inspirational								

speeches/addresses of success people, parliamentary speeches, interviews, various internet channels devoted to learning and improving communication in English

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Semester	IV				Version	2.0.0.0			
Effective from Academic Year	2019-20				Effective for the batch Admitted in	July-2018			
Subject code	BELE4BPT		Subject Name		Basic Probability Theory				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	02	--	--	--	02	Theory	40	60	100
Hours	02	--	--	--	02	Practical	--	--	--
Pre-requisites:									
Permutations and combinations.									
Learning Outcome:									
After successful completion of the course, students shall be able to calculate the degree of certainty of events in ideal conditions.									
Theory syllabus									
Unit	Content								Hrs
1	Classical- Statistical (or Empirical)- Axiomatic (Modern) definition of probability, Definitions of event, equally likely, mutually exclusive and exhaustive events, Probability theorems, Statements of Baye's theorem and examples, Conditional probability and examples.								15
2	Definitions of a Random variable, Probability Distribution of a random variable, Binomial distribution, Poisson distribution, Normal distribution, Exponential distribution and examples.								15
Reference Books									
1	Comprehensive Statistical Method, by P.N.Arora, Sumeet Arora, S. Arora								
2	Business Statistics, by Bharat Jhunjhunwala, S. Chand Prakashan.								
3	Business Statistics, by R.S. Bhardwaj								
4	Statistics (Chapter – 18 & 19) by, R.S.N.Pillai & V. Bagavathi,S. Chand & Company, New- Delhi								

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Semester	IV				Version	2.0.0.0			
Effective from Academic Year			2019-20		Effective for the batch Admitted in			July-2018	
Subject code	BELE4DMT		Subject Name		Disaster Management-II				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	02	--	--	--	02	Theory	40	60	100
Hours	02	--	--	--	02	Practical	--	--	----
Pre-requisites:									
<ul style="list-style-type: none"> • Students should have advance knowledge of different disasters. • Students should have ability to think over the serious issues in the society. • Students should be familiar with the preventive methods of disasters. 									
Learning Outcome:									
<ul style="list-style-type: none"> • Knowledge of different NGOs working methods during disaster. • Understanding the needs and expectations of relief camps at the level of post disaster. • Development of new strategies of Relief Operations. • Development of mental and physical strength as an individual. • Knowledge of Government Policies towards disaster. 									
Theory syllabus									
Unit	Content								Hrs
1	Man Made Disasters: War and Terrorism, Riots and Demonstrations, Residential and Industrial, Fires, Transportation Accidents, Nuclear Power Accidents, Hazardous Materials and Toxic Emission, Utility Failure.								15
2	Problems regarding victims and its awareness and Planning for disaster management: Saving Victims – First Twenty-Four Hours, Conducting Medical Relief Operations, Managing Relief Operations, Psychological Issues, Carrying Out Rehabilitation Work. Local Disaster Management Cell, How to Prepare a Business Recovery Plan? Government Response in Disaster.								15
Reference Books									
1	Citizen's guide to Disaster Management by Satish Modh Publisher:-Macmillan Publishers India,								
2	Disaster Management By G.K. Ghosh,A.P.H. Publishing Corporation								
3	Disaster Management By R.B. Singh, Rawat Publications								
4	Modern Encyclopaedia of Disaster and Hazard Management By B C Bose, Rajat Publications								
5	Disaster Management Future Challenges and Opportunities by Dr. Jagbir Singh. , I.K. International								
6	Environment and Sismic Engineering By Atul Prakashan Ahmedabad.								