

**GANPAT UNIVERSITY**

**Faculty of Science**

**Teaching and Examination scheme**

**&**

**Syllabus of**

**B.Sc. Microbiology**

**Semester III**

**Effective from July-2019**

# GANPAT UNIVERSITY

## FACULTY OF SCIENCE

### TEACHING AND EXAMINATION SCHEME

Programme		Bachelor of Science		Branch/Spec.		Microbiology														
Semester		III																		
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	BMIC3BCM	Microbial Biochemistry	3	--	3	2	2	3	--	3	3	1	4	40	60	100	40	60	100	
2	BMIC3MPM	Microbial Physiology and Metabolism	3	--	3	2	2	3	--	3	3	1	4	40	60	100	40	60	100	
3	BCHE3IPC	Inorganic and Physical Chemistry-I	3	--	3	2	2	3	--	3	3	1	4	40	60	100	40	60	100	
4	BCHE3OAC	Organic and Analytical Chemistry-I	3	--	3	2	2	3	--	3	3	1	4	40	60	100	40	60	100	
5		Elective*	2	--	2	--	--	2	--	2	--	--	--	40	60	100	--	--	--	
<b>Total</b>			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	BELE3PFS	Professional Skills
2	BELE3BST	Basic Statistics
3	BELE3DMT	Disaster Management-I
4	MOOCs courses from SWAYAM PORTAL	

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Bachelor of Science				Branch/Spec.	Microbiology			
Semester	III				Version	2.0.0.0			
Effective from Academic Year		2019-20			Effective for the batch Admitted in		July-2018		
Subject code	BMIC3MBC		Subject Name		Microbial Biochemistry				
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 basic knowledge of Biochemistry up to 10+2 level.									
Learning Outcome:									
The course will help students to understand the basic fundamentals of bioenergetics and thermodynamics in biochemical reactions. It will also impart knowledge of various biomolecules in living systems to students.									
Theory syllabus									
Unit	Content							Hrs	
1	Bioenergetics & Thermodynamics: <ul style="list-style-type: none"> <li>– Basic introduction to laws of Thermodynamics. Definitions of Gibb’s Free Energy, Enthalpy &amp; Entropy and Mathematical relationship among them.</li> <li>– Standard free energy change and equilibrium constant.</li> <li>– Common biochemical reactions: Reactions responsible for creating or breaking carbon–carbon bonds; Internal Rearrangements, Isomerizations and Eliminations; Free-Radical Reactions; Group Transfer Reactions; Oxidation-Reduction Reactions</li> <li>– Energy rich compounds: Phosphoenolpyruvate, 1,3-Bisphosphoglycerate, Thioesters, ATP.</li> </ul>							09	
2	Carbohydrates and Proteins: <ul style="list-style-type: none"> <li>– Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo &amp; Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein’s and their biological functions.</li> <li>– Proteins: General Structure, Classification and properties of amino acids. Structural organization and classification of proteins. Properties of proteins. Denaturation and renaturation of proteins, Fibrous and globular proteins.</li> </ul>							12	
3	Lipids and Nucleic acids: <ul style="list-style-type: none"> <li>– Lipids: Definition, Classification and Function of lipids. Fatty acids, Essential fatty acids and triacylglycerols. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol. Introduction of lipid micelles, monolayers, bilayers.</li> <li>– Nucleic acids: Types and functions of nucleic acids. Structure of nucleic acids: Nucleoside and Nucleotides, Structure and various forms of DNA, Basic organization of</li> </ul>							12	

	DNA in cells, Structure and types of RNA, Ribozymes.	
4	<p>Enzymes and Vitamins:</p> <ul style="list-style-type: none"> <li>– Enzymes: Nomenclature and classification. Structure of enzyme (Apoenzyme, holoenzyme, coenzyme, cofactor, prosthetic groups). Units of enzyme activity.</li> <li>– Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis.</li> <li>– Michaelis-Menten equation and Lineweaver-Burk plot and their significance. Enzyme Inhibition. Factors affecting enzyme activity.</li> <li>– Application and diagnostic importance of enzymes.</li> <li>– Vitamins: Classification and characteristics with suitable examples, sources and importance</li> </ul>	12
<b>Reference Books</b>		
1	Nelson DL and Cox MM (2013). Lehninger Principles of Biochemistry, 6 <sup>th</sup> ed., W.H. Freeman and Company.	
2	Voet D and Voet JG (2011). Biochemistry, 4 <sup>th</sup> Ed., John Wiley and Sons.	
3	Campbell MK (2012). Biochemistry, 7 <sup>th</sup> ed., Cengage Learning.	
4	Tymoczko JL, Berg JM and Stryer L (2012). Biochemistry: A short course, 2 <sup>nd</sup> ed., W. H. Freeman and company.	
5	Satyanarayana U and Chakrapani U (2013). Biochemistry, Elsevier and Books & Allied (P) Ltd.	
<b>List of Practicals</b>		
1	Properties of water, Concept of pH and buffers, preparation of buffers and Numerical problems to explain the concepts.	
2	Numerical problems on calculations of Standard Free Energy Change and Equilibrium constant	
3	Qualitative tests for Carbohydrates, Proteins, and Lipids.	
4	Cole's Method for estimation of reducing sugar.	
5	Estimation of carbohydrates using Nelson-Somogyi's method.	
6	Estimation of protein using Bradford method.	
7	Study of enzyme kinetics - calculation of $V_{max}$ , $K_m$ , $K_{cat}$ values.	
8	Study effect of temperature on enzyme activity.	
9	Study effect of pH on enzyme activity.	

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Bachelor of Science				Branch/Spec.	Microbiology			
Semester	III				Version	2.0.0.0			
Effective from Academic Year		2019-20			Effective for the batch Admitted in		July-2018		
Subject code	BMIC3MPM		Subject Name		Microbial Physiology and Metabolism				
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 basic aspects of cellular metabolism and enzymes. In addition students will be able to know about the nutrition and growth of microbes.									
Theory syllabus									
Unit	Content							Hrs	
1	Microbial Growth, Nutrient Uptake and Transport: – Definitions of Growth. Quantitative Measurement of Microbial Growth (Direct microscopic count, Electronic enumeration of cell numbers, Plate count method, Membrane filter method, Turbidometric methods, Biomass based methods) – Batch culture, Continuous culture, synchronous growth, diauxic growth curve. – Passive and facilitated diffusion. Primary and secondary active transport, concept of uniport, symport and antiport. Group translocation. Iron uptake.							11	
2	Effect of Environment on Microbial Growth: – Microbial growth in response to nutrient and energy: Nutritional requirements of bacteria. Phototrophs, Chemotrophs, Autotrophs and Heterotrophs and Obligate parasites. – Microbial growth in response to environment: Temperature (psychrophiles, mesophiles, thermophiles, thermodurics and psychrotrophs), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe and facultative anaerobe), pH (acidophiles and alkaliphiles), Solute and water activity (halophiles, xerophiles, osmophilic), Barophiles.							11	
3	Chemoheterotrophic Metabolism: – Aerobic Respiration: Concept of aerobic respiration, anaerobic respiration and fermentation. Sugar degradation pathways i.e. Glycolysis, EMP, ED, Pentose phosphate pathway, TCA cycle. – Electron transport chain: components of respiratory chain, comparison of mitochondrial and bacterial ETC, oxidative phosphorylation, uncouplers and inhibitors. – Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate/nitrite and nitrate/ammonia respiration; fermentative nitrate reduction)							12	

	– Fermentation - Alcohol fermentation and Pasteur Effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways.	
4	Chemolithotrophic and Phototrophic Metabolism: – Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction) – Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria, purple bacteria and cyanobacteria.	11
<b>Reference Books</b>		
1	Pelczar Jr. MJ, Chan ECS & Krieg NR (2001). Microbiology, Indian ed., McGraw-Hill.	
2	Willey JM, Sherwood LM & Woolverton CJ (2014). Prescott's Microbiology, 9 <sup>th</sup> ed., McGraw Hill.	
3	Modi HA (2014). Handbook of Elementary Microbiology, Shanti Prakashan, Ahmedabad.	
4	Medigan MT, Martinko JM, Bender KS, Buckley JH & Stahl DA (2015). Brock biology of microorganisms, 14 <sup>th</sup> ed., Pearson Education.	
5	Stanier RY, Ingraham JL, Wheelis ML & Painter PR (1986). General Microbiology, 5 <sup>th</sup> ed., MacMillan Press Ltd.	
6	Gottschalk G (1986). Bacterial Metabolism. 2 <sup>nd</sup> ed., Springer Verlag.	
7	Reddy SR and Reddy SM (2005). Microbial Physiology. Scientific Publishers India.	
8	Moat AG, Foster JW and Spector MP (2002). Microbial Physiology, 4 <sup>th</sup> ed., John Wiley & Sons.	
<b>List of Practicals</b>		
1	Study and plot the growth curve of <i>E. coli</i> by turbidometric and standard plate count methods.	
2	Effect of temperature on growth of <i>E. coli</i> .	
3	Effect of pH on growth of <i>E. coli</i> .	
4	Effect of various carbon sources on growth of <i>E. coli</i> .	
5	Effect of various nitrogen sources on growth of <i>E. coli</i> .	
6	Effect of salt on growth of <i>E. coli</i> .	
7	Study biochemical reaction of bacteria: A. Based on carbon source: Fermentation of sugars and sugar alcohol. Methyl red test & Voges-Proskauer's test. Citrate utilization test. Starch utilization test. Lipid utilization test.	
8	Study biochemical reaction of bacteria: B. Based on nitrogen source: Indole production test. H <sub>2</sub> S production test. Urea utilization test. Casein hydrolysis test. Gelatin hydrolysis test. Deamination test.	
9	Study biochemical reaction of bacteria: C. Other tests: Catalase test. Dehydrogenase test. Oxidase test.	
10	Calculations of generation time and specific growth rate of bacteria from the graph plotted with the given data.	

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
PROGRAMME		B.Sc.			Branch/Spec.		Microbiology		
SEMESTER		III			Version		2.0.0.0		
Effective From Academic Year			2019-20		Effective for the batch Admitted in			July-2018	
Subject Code		BCHE3IPC		Subject Name		Inorganic and Physical Chemistry-I			
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"> <li>✓ Basics of Inorganic, Organic, Physical and Analytical chemistry concepts</li> <li>✓ Ionic solids, organic functional groups, IUPAC, structure of compound.</li> <li>✓ Chemical kinetics, EMF, order reaction, electrode</li> <li>✓ Qualitative Analysis, water analysis, TDS, hardness of water</li> </ul>									
Theory Syllabus									
Unit	Content							Hrs	
01	<b>Thermochemistry</b> Enthalpy of a Reaction - Exothermic and Endothermic Reactions - Thermochemical Equations - Heat of Reaction or Enthalpy of Reaction - Heat of Combustion - Heat of Solution - Heat of Neutralisation - Energy Changes During Transitions or Phase Changes - Heat of Fusion - Heat of Vaporisation - Heat of Sublimation - Heat of Transition - Hess's Law of Constant Heat Summation - Applications of Hess's Law - Bond Energy - Measurement of the Heat of Reaction							15	
02	<b>Chemistry of Elements of First Transition Series</b> Characteristic properties of d-block elements. Binary compounds (hydrides, carbides and oxides) of the elements of the first transition series and complexes with respect to relative stability of their oxidation states, coordination number and geometry. <b>Chemistry of Elements of Second and Third Transition Series</b> General characteristics, comparative treatment of Zr/Hf, Nb/Ta, Mo/W in respect of ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry.							15	
03	<b>Industrial Chemistry:</b> <b>Soap &amp; Detergents:</b> Introduction to soap, Types of soap, Manufacturing of soap, Introduction to detergents, Principal group of synthetic detergents, Biodegradability of surfactants, Classification of surface active agents, Anionic detergents, Cationic detergents, Non Ionic detergents, Manufacture of shampoo. <b>Insecticides &amp; Fertilizers:</b> Introduction, classification of insecticides, synthesis and uses of dinitrophenols, DDT, Methoxychlor, Benzene hexachloride, Gammexane, Aldrin biodegradation of pesticides, application of pesticides. Plant nutrients, micro nutrients, need for fertilizer, essential requirements. Bio fertilizer, application of fertilizer.							15	

#### Reference Books

1. Elements of Physical Chemistry by Samuel Glasstone and D Lewis
2. Principles of Physical Chemistry by SH Maron and CF Prutton
3. Thermodynamics for Chemists by Samuel Glasstone
4. Elements of Physical Chemistry by BR Puri, LR Sharma, MS Pathania
5. Advanced Physical Chemistry by JN Gurtu
6. Physical Chemistry by N Kundu and SK Jain
7. Selected topics in Inorganic Chemistry', Wahid U. Malik, G. D. Tuli, R. D. Madan.
8. Principles of Inorganic Chemistry, Puri, Sharma and Kalia.
9. Advanced Inorganic Chemistry (Volume-II), Satya Prakash, G. D. Tuli, S. K. Basu & R D Madan.
10. Advanced Inorganic chemistry, Gurdeep Raj, Goel Publishing House.
11. Shriver and Atkins Inorganic Chemistry: Atkins, Overton, Rourke, Weller, Armstrong, Oxford University Press.
12. Introduction to Quantum Chemistry, A K Chandra, McGraw-Hill.
13. Industrial Chemistry -B.K. Sharma
14. Outlines of Chemical Technology - Charles Dryden
15. Regiel's Handbook of Industrial Chemistry - James A. Kent
16. Engineering Chemistry- Jain & Jain
17. Environmental Chemistry -A.K. De

#### List of Practicals

- |   |  |
|---|--|
| 1 | Inorganic Mixture: Four radicals. It may include two positive Radicals and two negative radicals. Cd <sup>2+</sup> , Cu <sup>2+</sup> , Bi <sup>3+</sup> , Fe <sup>2+</sup> , Zn <sup>2+</sup> , Al <sup>3+</sup> , Ni <sup>2+</sup> , Mn <sup>2+</sup> , Ba <sup>2+</sup> , Sr <sup>2+</sup> , Ca <sup>2+</sup> , Mg <sup>2+</sup> , NH <sub>4</sub> <sup>+</sup> , K <sup>+</sup> , Cl <sup>-</sup> , Br <sup>-</sup> , I <sup>-</sup> , NO <sub>3</sub> <sup>-</sup> , CO <sub>3</sub> <sup>2-</sup> , S <sup>2-</sup> , PO <sub>4</sub> <sup>3-</sup> , BO <sub>3</sub> <sup>3-</sup> , SO <sub>4</sub> <sup>2-</sup> , CrO <sub>4</sub> <sup>2-</sup> , Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup> etc. |
|---|--|

#### 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.
13. 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		III			Version			2.0.0.0	
Effective From Academic Year				2019-20		Effective for the batch Admitted in			July-2018
Subject Code		BCHE3OAC		Subject Name		Organic and analytical Chemistry-I			
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 organic and analytical chemistry, all students have basic knowledge of organic compounds, molecular structure, spectroscopy and knowledge related to basics of chemistry.									
Learning Outcome									
After the successful completion of the course, students will be able to understand									
<ul style="list-style-type: none"> <li>✓ Basics of Organic, Analytical and Heterocyclic compounds concepts.</li> <li>✓ Chromatography and electronic spectra's structure of compound.</li> <li>✓ Hetero atoms, classification, chemical reactions and synthesis.</li> <li>✓ To create interest in students in learning organic, analytical chemistry.</li> </ul>									
Theory Syllabus									
Unit	Content								Hrs
01	<p><b>Aldehydes and Ketones:</b> Nomenclature and structure of the carbonyl groups, synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones uses 1, 3-dithianes, synthesis of ketones from nitrites and from carboxylic acids.</p> <p><b>Carboxylic Acids:</b> Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength, Preparation of carboxylic acids, Reactions of carboxylic acids, Hell-Volhard-Zelinsky reaction, Synthesis of acid chlorides, esters and amides, Reduction of carboxylic acids, Mechanism of decarboxylation.</p>								15
2	<p><b>Chromatography:</b> Principle of adsorption and partition chromatography, column chromatography: adsorbents, classification of adsorbents, solvents, preparation of column, adsorption and applications. Thin Layer Chromatography: choice of adsorbent, choice of solvent, preparation of chromatogram, sample, R<sub>f</sub> value and its applications. Paper chromatography, solvent used, R<sub>f</sub> value, factors which affect R<sub>f</sub> value.</p> <p><b>Electromagnetic Spectrum Absorption Spectra</b> Ultraviolet (UV) absorption spectroscopy – absorption laws (Beer-Lambert law); molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation.</p>								15
03	<p><b>Heterocyclic compounds</b> Introduction, tautomerism, physical properties of pyrrole, furan and thiophene, synthesis of pyrrole (Knorr synthesis, Paal-knorr synthesis, Hantzsch synthesis), chemical reactions of pyrrole, synthesis of furan (Paal-Knorr synthesis, Fiest Benary reaction, from other heterocyclic system), chemical reactions of furan, synthesis of thiophene (Paal-knorr synthesis, Simmon-smith reaction, from unsaturated compounds), chemical reactions of thiophene.</p>								15

### Reference Books

1. Organic reaction mechanism: An Introduction, Ronald Breslow; Benjamin
2. Reaction and reagents; O. P. Agrawal; Goel Publishing House, Meerut
3. Organic Chemistry, 7<sup>th</sup> edition, Morrison and Boyd; Pearson Education Inc.
4. Medicinal Chemistry; Vol.1, A. Burger; Wiley Interscience
5. Organic Chemistry; Vol. I, II & III, S. M. Mukherji, S. P. Singh and R. P. Kapoor, New Age International Publishers
6. A Text Book of Organic Chemistry; R. K. Bansal; New Age International Publishers
7. Text Book of Organic Chemistry; P.L.Soni; S. Chand & Sons
8. Organic Chemistry Natural Products; Vol. I & II, O. P. Agarwal; Goel Publishing House, Meerut
9. 'A Text Book of Organic Chemistry', R. K. Bansal, *New Age International (P) Ltd.*
10. 'Organic Reaction Mechanism', V. K. Ahluwalia, *R.K. Parasar.*
11. 'Organic Chemistry', Morrison and Boyd, *prentice hall of India pvt ltd.*
12. 'Organic Chemistry', I. L. Finar, *Pearson Education.*
13. 'Advanced Organic Chemistry', Jerry March.
14. 'Reaction Mechanism and Reagents in Organic Chemistry', Gurdeep R. Chatwal.
15. 'Organic Chemistry', V. K. Ahluwalia, Madhuri Goyal, *Narosa Publishing House.*
16. 'Organic Synthesis', M. B. Smith, *Mcgraw-Hill, Inc.*
17. 'Comprehensive Organic Synthesis', B.M. Frost & I Fleming, *Pergamon.*
18. 'Organic Chemistry – Structure and Reactivity', Seyhan Ege, *A.I.T.B.S. Publishers and Distributors.*
19. 'Organic Synthesis – Strategy and Control', Paul Wyatt & Stuart Warren, *John Wiley & Sons.*
20. 'Principles of Organic Synthesis', R. O. C. Norman, J. M. Coxon, *CRC Press.*
21. 'Organic Chemistry', J. Clayden, N. Greeves, S. Warren, P. Wothers, *Oxford University Press.*

### List of Practicals

- 1 **Volumetric Titration** (By self-preparation of solution of titrant):  
Estimation of copper by iodometric method.  
Determination of total hardness of water sample.  
Determination of nickel by back titration.  
Determination of nitrite by back titration.  
**Chromatography:** Paper chromatography

### 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.
13. B.K. Sharma and H.Kaur, Environmental Chemistry, Goel Publishing House, Meerut, 3rdEdn, 1996

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Bachelor of Science				Branch/Spec.	Microbiology			
Semester	III				Version	2.0.0.0			
Effective from Academic Year	2019-20				Effective for the batch Admitted in	July-2018			
Subject code	BELE3PFS		Subject Name		Professional Skills				
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"> <li>• listen, understand and respond effectively</li> <li>• read, comprehend and apply the acquired knowledge/information in various practical situations</li> <li>• speak efficiently under various conditions</li> <li>• write various drafts in clear and concise manner</li> </ul>									
Theory syllabus									
Unit	Content								Hrs
1	<b>Professional Etiquettes:</b> Work place etiquettes, Table Manners and Meal etiquettes, Professionalism, Communication Etiquettes, Social Etiquettes and Meeting Etiquettes.								07
2	<b>Professional Telephony:</b> Significance of telephony in professional World, Etiquettes while Making and Receiving Calls, Leaving Messages, Asking Caller to Wait, Asking for Repetition and Clarification, Ending the Call, Tips for Effective Telephony, Practice of Professional Telephony Based on Role play								09
3	<b>Oral Proficiency:</b> <b>Debate:</b> Definition, Structure, Strategies, Types, Difference between Group Discussion and Debate, Dos and Don'ts, Tips for Successful Debate <b>Interview:</b> Definition, Types, Preparing for Interview, Interview Etiquettes, dealing with nerves, Body Language, Communication, Closing the Interview, Common Questions, Mock Interviews								06
4	<b>Ethics:</b> Human Values: Lessons for the Lives and Teachings of the great Leaders, Reformers and Administrators, Role of Family, Society and Educational Institutions in inculcation of Values, Ethics in Private and Public Relationships. Ethics as a driving force of Human actions and Consequences.								08
<b>Reference Books</b>									
1	Technical Communication - Principles and Practice by Meenaksi Raman & Sangeeta Sharma (Oxford University Press)								
2	Effective Technical Communication by M Ashraf Rizvi (TMH Publication)								
3	Cambridge IELTS 1-10, Cambridge University Press								
4	A Communicative Grammar of English by Geoffery Leech and Fan Svartvik (Pearson Longman)								

5	Telephone English by John Hughes
6	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

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Bachelor of Science				Branch/Spec.	Microbiology			
Semester	III				Version	2.0.0.0			
Effective from Academic Year			2019-20		Effective for the batch Admitted in			July 2018	
Subject code	BELE3BST		Subject Name		Basic Statistics				
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:									
Logical arguments and theory of probability.									
Learning Outcome:									
After successful completion of the course, students shall be able to work with data, their analysis as well as use the correlation and regression analysis.									
Theory syllabus									
Unit	Content								Hrs
1	Measures of central tendency: Mean, mode and median, harmonic and geometric means. Measures of dispersion: Range, standard deviation, mean deviation.								15
2	Correlation & Regression analysis :Definitions of correlation, positive & negative correlations, Scatter diagram, Karl- Pearson's coefficient of linear correlation, Properties of correlation coefficients and examples, regression coefficient, properties of regression coefficient and examples.								15
Reference Books									
1	Comprehensive Statistical Method, P.N.Arora, Sumeet Arora, S. Arora								
2	Business Statistics , R.S.Bhadyaj								
3	Business Statistics , Bharat Jhnujhunwala								
4	Biostatistics, Veerbala Rastogi								

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Bachelor of Science				Branch/Spec.	Microbiology			
Semester	III				Version	2.0.0.0			
Effective from Academic Year	2019-20				Effective for the batch Admitted in	July-2018			
Subject code	BELE3DMT		Subject Name		Disaster Management-I				
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"> <li>Students should have basic knowledge of Environment and environmental problems.</li> <li>Students should have acquaintances with natural resources.</li> </ul>									
Learning Outcome:									
<ul style="list-style-type: none"> <li>Knowledge of Natural Disasters.</li> <li>Understanding of seismic engineering.</li> <li>Development of thinking to take necessary actions during disaster.</li> </ul>									
Theory syllabus									
Unit	Content								Hrs
1	<b>Natural Disasters :</b> <b>Types of Natural Disasters:</b> Cyclone, Flood, Fire, Desert Storms, Land Slides and Snow avalanches. <b>Cyclone:</b> Introduction, Fundamentals, Characteristics, Causes and Effects, Preventive and Remedial measures. <b>Flood:</b> Introduction, Fundamentals, Causes and Effects, Preventive and Remedial measures. <b>Fire:</b> Fundamentals, Causes and Effects, Preventive and Remedial measures.								15
2	<b>Fundamentals of Seismic Engineering:</b> Introduction, Definition, History of earthquake, Earth and its structure, Terminology, Epicentre, Hypocenter, Focus, Epicentre distance, Waves generated due to earthquake, P waves, S waves, Causes and Measurement of earthquake, Intensity and magnitude of earthquake, Sysmo-graph, Sysmo-scope, Sysmo-meter, Richter scale, Zoning of earthquake as per I.S. Effects of earthquake on Soil, Low-rise and high-rise buildings, Human psychology, Communication, Geology, General instructions for protection of people during earthquake. General guidelines for construction and maintenance of earthquake proof/resistant masonry structure								15
References 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 Sesmic Engineering By Atul Prakashan Ahmedabad.								