BAGALKOT UNIVERSITY

Mudhol Road, Jamkhandi-587301 Dist: Bagalkot

PROGRAM /COURSE STRUCTURE AND SYLLABUS
FOR

MICROBIOLOGY

as per the Choice Based Credit System (CBCS) designed in accordance with Learning Outcomes-Based Curriculum Framework (LOCF)

For

Bachelor of Science
(MICROBIOLOGY)

(General Degree)

III Semester

w.e.f.

As per NEP 2020 and adapted from RCU Belagavi applicable from the

Academic Year 2024-25

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Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Microbiology Major & One Minor Discipline Scheme for the Four Years Microbiology B.Sc. Undergraduate Honors Programme with effect from 2021-22

SECOND YEAR; SEMESTER-III										
Category	**Course code**	**Title of thePaper**	**Marks**			**Teaching hours/week**			**Credit**	**Duration of exams (Hrs)**
			IA	**SEE**	**Total**	**L**	**T**	**P**		
L5	----------	Languages	40	60	100	4	-	-	3	2
L6	----------	Languages	40	60	100	4	-	-	3	2
DSC3	126BSC03MIBDSC03T	Microbial Diversity	40	60	100	4	-	-	4	2
	126BSC03MIBDSC03L	Microbial Diversity	25	25	50	-	-	4	2	4
DSC3	Another Department Code	Another Department Course Title	40	60	100	4	-	-	4	2
			25	25	50	-	-	4	2	4
SEC2	126COM03XXXSEC03T	Artificial Intelligence	25	25	50	1	-	2	2	2
VBC5	126COM03XXXVBC05L	NCC/NSS/R&R(S&G) / Cultural	25	-	25	-	-	2	1	-
VBC6	126COM03XXXVBC06B	Physical Education – Sports	25	-	25	-	-	2	1	-
OEC3	126BSC03MIBOEC03T	Microbial Entrepreneurship	40	60	100	3	-	-	3	2
Total Marks					**700**	**Semester Credits**			**25**	

Concept Note, Abbreviation Explanation and Coding:

Concept Note:

1. **CBCS** is a mode of learning in higher education which facilitates a student to have some freedom in selecting his/her own choices, across various disciplines for completing a UG/PG program.
2. A credit is a unit of study of a fixed duration. For the purpose of computation of workload as per UGC norms the following is mechanism be adopted in the University:
   One credit (01) = One Theory Lecture (L) period of one (1) hour.
   One credit (01) = One Tutorial (T) period of one (1) hour.
   One credit (01) = One practical (P) period of two (2) hours.
3. Course: paper/subject associated with AECC, DSC, DSEC, SEC, VBC, OEC, VC, IC and MIL
4. In case of **B.Sc**. **Once a candidate chose two courses/subjects of a particular two department in the beginning, he/she shall continue the same till the end of the degree, then there is no provision to change the course(s) and Department(s).**
5. A candidate shall choose **one of the Department's courses as major and other Department course as minor in fifth and sixth semester and major course will get continued in higher semester.**
6. Wherever there is a practical there will be no tutorial and vice-versa
7. A major subject is the subject that's the main focus of Core degree/concerned.
8. A minor is a secondary choice of subject that complements core major/ concerned.
9. Vocational course is a course that enables individual to acquire skills set that are required for a particular job.
10. Internship is a designated activity that carries some credits involving more than **25 days** of working in an organization (either in same organization or outside) under the guidance of an identified mentor. Internship shall be an integral part of the curriculum.
11. **OEC: For non- Microbiology students. Microbiology students have to opt for OEC from departments other than major and minor disciplines.**

Abbreviation Explanations:

1. AECC: Ability Enhancement Compulsory Course.
2. DSC: Discipline Specific Core Course.
3. DSEC: Discipline Specific Elective Course.
4. SEC: Skill Enhancement Course.
5. VBC: Value Based Course.
6. OEC: Open/Generic Elective Course
7. VC: Vocational Course.
8. IC: Internship Course
9. L1: Language One
10. L2: MIL
11. L= Lecture; T= Tutorial; P=Practical.
12. MIL= Modern Indian Language; English or Hindi or Telugu or Sanskrit or Urdu

Program Coding:

1. Code 21: Year of Implementation
2. Code BSC: BSC Program under the faculty of Applied Science of the University
3. Code 1: First Semester of the Program, (2 to 6 represent higher semesters)
4. Code AE: AECC, (C for DSC, S for SEC, V for VBC and O for OEC)
5. Code 1: First "AECC" Course in semester, similarly in remaining semester for such other courses

6. Code LK: Language Kannada, similarly Language English, Language Hindi, Language Telugu, Language Sanskrit, &Language Urdu
7. Code 1: Course in that semester.
8. MB: Microbiology

Note: *All skill enhancement course (SEC) syllabus and title should be selected time to time notice from the university and/ or NEP accordingly.*

ASSESSMENT METHODS

Evaluation Scheme for Internal Assessment:

Theory:

Assessment Criteria	40 marks
1st Internal Assessment Test for 30 marks 1 hr after 8 weeks and 2nd Internal Assessment Test for 30 marks 1 hr after 15 weeks. Average of two tests should be considered.	30
Assignment	10
Total	**40**

Assessment Criteria	25 marks
1st Internal Assessment Test for 20 marks 1 hr after 8 weeks and 2nd Internal Assessment Test for 20 marks 2 hr after 15 weeks. Average of two tests should be considered.	20
Assignment	05
Total	**25**

Practical:

Assessment Criteria	25 marks
Semester End Internal Assessment Test for 20 marks 2 hrs	20
Journal (Practical Record)	05
Total	**25**

Question Paper Pattern:

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Duration: 2hrs ***I Semester B.Sc (Microbiology)***

Sub: Code: Maximum Marks: 60

a. Answer any Sixe Questions from Question 1

b. Answer any Three each Questions from Question numbers 2,3,4 and 5

Q.No.1.	**Answer any Six Questions (Two question from Each Unit)** **a.** **b.** **c.** **d,** **e.** **f.** **g.** **h.**	**2X6=12**
Q.No.2.	**Answer any Three (Should cover Entire Unit-I)** **a.** **b.** **c.** **d.**	**4X3=12**
Q.No.3.	**Answer any Three (Should cover Entire Unit-II)** **a.** **b.** **c.** **d.**	**4X3=12**
Q.No.4.	**Answer any Three (Should cover Entire Unit-III)** **a.** **b.** **c.** **d.**	**4X3=12**
Q.No.5.	**Answer any Three (Should cover Entire Unit-IV)** **a.** **b.** **c.** **d.**	**4X3=12**

Semester-3: BSc Microbiology (Basic /Hons)
Course code: 126BSC03MIBDSC03T
Paper Title: Microbial Diversity

Program Name	**BSc Microbiology**	Semester	**Third Sem**
Course Title	**Microbial Diversity**	**Course Code: 126BSC03MIBDSC03T**	
No. of Theory Credits	**4**	Contact hours	**56hrs**
Duration of Exam	**2 Hours**		

Course Outcomes (COs): At the end of the course the student should be able to:

1. Knowledge about microbes and their diversity
2. Study, characters, classification and economic importance of Pro-eukaryotic and Eukaryotic microbes.
3. Knowledge about viruses and their diversity

Contents	Hrs
Unit–I	**06 Hrs**
Biodiversity and Microbial Diversity Concept, definition, and levels of biodiversity; Biosystematics – Major classification systems- Numerical and Chemotaxonomy. Study and measures of microbial diversity; Conservation and Economic values of microbial diversity.	
Unit -II	
Diversity of Prokaryotic Microorganisms General characters; Classification; Economic importance; Distribution and factors regulatingdistribution. **Bacteria and Archaea-** An overview of Bergey‟s Manual of Systematic Bacteriology.**Bacteria-** *Escherichia coli, Bacillus subtilis,* *Staphylococcus aureus***Cyanobacteria**- *Nostoc, Microcystis, Spirulina* **Archea** *Thermusaquaticus,* Methanogens **Actinomycetes:** *Streptomyces, Nocordia,* *Frankia* **Rickettsiae-** *Rickettsia rickettsi* **Chlamydiae –** *Chlamydia trachomatis* **Spirochaetes**- *Trepanemapallidum*	**18 Hrs**
Unit –III	
Diversity of Eukaryotic Microorganism **Diversity of Eukaryotic Microorganism**: General characters; Classification- Economicimportance **Fungi:** Ainsworth classification- detailed study up to the level of classes, Salient features and reproduction. Type study: *Rhizopus, Saccharomyces, Aspergillus, Agaricus, Fusarium*	**16 Hrs**

Algae: Occurrence, distribution, and symbiotic association- Lichen; thallus organization andtypes. Type study: *Chlorella, Cosmarium,* Diatoms,*Gracilaraia,* **Protozoa:** Classification up to the level of classes. Type study: *Amoeba, Euglena, Trichomonas,* *Paramoecium, Trypanosoma*	
Unit -IV	**16 Hrs**
Diversity of Virus General properties and structure, Isolation and purification and assay of virus. Principles of ViralTaxonomy- Baltimore and ICTV and the recent trends. Capsid symmetry- Icosahedral, helical, complex **Animal:** HIV, Corona, Ortho and paramyxovirus, Oncogenic virus **Plants:** TMV, Ring spot virus **Microbial:** T4/T7/lambda/cyano/mycophages. Sub viral particles.Virans and Prions. Ortho and Paramyxo Virus. Oncogenic Virus.	

Microbiology lab contents –Semester-3
Course code: 126BSC03MIBDSC03L
Title paper: Microbial Diversity

Course Title **Course Code**	**Microbial Diversity** **126BSC03MIBDSC03L**		Practical Credits	**2**
Course No.	**MBL-103**	**DSC-3P**	Contact hours	**4**

Content

1. Study of morphology of bacteria
2. Isolation of bacteria from soil
3. Isolation of bacteria from air and water
4. Isolation of fungi from soil
5. Isolation of fungi from air and water
6. Cultivation of Cyanobacteria
7. Cultivation of actinomycetes
8. Measurement of microbial cell size by Micrometry
9. Cyanobacteria Nostoc, Microcyctis Spirulina
10. Study of Algae Chlorella Diatoms, Gracilaria
11. Study of Fungi Rhizopus Saccharomyces Agaricus
12. Study of Protozoa Amoeba Paramoecium Euglena
13. Study of Photographs or Models
14. HIV, TMV, Corona virus T4Phage
15. Paramyxovirus Oncogenic viruses

Practical assessment

Assessment			
Formative assessment		**Summative Assessment**	**Total Marks**
Assessment Occasion / type	**Weightage in Marks**	**Practical Exam**	
Record	5	25	**50**
Test	10		
Attendance	5		
Performance	5		
Total	**25**	**25**	

References	
1	Black, J.G. 2002. Microbiology-Principles and Explorations. John Wiley and Sons, Inc. New York
2	Brock, T.D. and Madigan, M.T. 1988. Biology of Microorganisms, V Edition. Prentice Hall. New Jersey
3	Dimmock, N. J., Easton, A. J., and Leppard, K. N. 2001. Introduction to Modern Virology. 5th edn. Blackwell publishing, USA
4	Flint, S.J., Enquist, L.W., Drug, R.M., Racaniello, V.R. and Skalka, A.M. 2000. Principles of Virology- Molecular Biology, Pathogenesis and Control. ASM Press, Washington, D.C

5	Prescott, Harley, Klein‟s Microbiology, J.M. Willey, L.M. Sherwood, C.J. Woolverton, 7th International, edition 2008, McGraw Hill
6	Vashishta B.R, Sinha A.K and Singh V. P. Botany – Fungi 2005, S. Chand and Company Limited, New Delhi
7	Kotpal R.L Protozoa 5th Edition 2008, Rastogi Publications, Meerut, New Delhi.
8	Brock Biology of Microorganisms, M.T. Madigan, J.M. Martinko, P. V. Dunlap, D. P. Clark- 12th edition, Pearson International edition 2009, Pearson Benjamin Cummings
9	Microbiology – An Introduction, G. J. Tortora, B. R. Funke, C. L. Case, 10th ed. 2008, Pearson Education
10	General Microbiology, Stanier, Ingraham et al, 4th and 5th edition 1987, Macmillan education limited
11	Microbiology- Concepts and Applications, Pelczar Jr. Chan, Krieg, International ed, McGraw Hill
12	Alexopoulos, C.J., Mims, C.W., and Blackwell, M. 2002. Introductory Mycology. John Wiley and Sons (Asia) Pvt. Ltd. Singapore. 869 pp
13	Vashishta, B.R Sinha A.K and Singh V. P. Botany - Algae 2005 S. Chand and Company Limited, New Delhi
14	A Textbook of Microbiology, R. C. Dubey, and D. K. Maheshwari, 1st edition, 1999, S. Chand & Company Ltd, New Delhi
15	Foundations in Microbiology, K. P. Talaro, 7th International edition 2009, McGraw Hill

Semester-III
Open elective-Microbiology (OEC3)Course code: 126BSC03MIBOEC03T
Title of the paper: Microbial Entrepreneurship

Program Name	**BSc Microbiology**		Semester	**Third Sem**
Course Title	**Microbial Entrepreneurship**			
Course Code	126BSC03MIBOEC03T	**OEC-3**	No. of Theory Credits	**3**
Contact hours	**Lecture**		Duration of ESA/Exam	**2 Hours**
	Practical			
Formative Assessment Marks	**40**		Summative Assessment Marks	**60**

Course Pre-requisite(s):	
Course Outcomes (COs): At the end of the course the student should be able to: 1. Demonstrate entrepreneurial skills 2. Acquire knowledge industrial entrepreneurship 3. Acquire knowledge about Healthcare Entrepreneurship	
CONTENT	**42 HRS**
Unit–I	**14 Hrs**
General Entrepreneurship Entrepreneurship and microbial entrepreneurship - Introduction and scope, Business development, product marketing, HRD, Biosafety and Bioethics, IPR and patenting, Government organization/ institutions/ schemes, Opportunities and challenges.	
UNIT -II	**14 HRS**
Industrial Entrepreneurship Microbiological industries – Types, processes and products, Dairy products, Fermented foods, Bakery and Confectionery, Alcoholic products and Beverages, Enzymes – Industrial production and applications. Biofertilizers and Biopesticides, SCP (Mushroom and Spirulina) etc.	
Unit -III -	**14 Hrs**
Healthcare Entrepreneurship Production and applications: Sanitizers, Antiseptic solutions, Polyhenols (Flavonoids), Alkaloids, Cosmetics, Biopigments and Bioplastics, vaccines, Diagnostic tools and kits.	

References

1	Srilakshmi B, (2007), Dietetics. New Age International publishers. New Delhi
2	Srilakshmi B, (2002), Nutrition Science. New Age International publishers. New Delhi
3	Swaminathan M. (2002), Advanced text book on food and Nutrition. Volume I. Bappco
4	Gopalan.C.,RamaSastry B.V., and S.C.Balasubramanian (2009), Nutritive value of Indian Foods.NIN.ICMR.Hyderabad.
5	Mudambi S R and Rajagopal M V, (2008), Fundamentals of Foods, Nutrition & diet therapy by New Age International Publishers, New Delhi