FACULTY OF SCIENCE

SYLLABI

FOR

B.Sc. MICROBIAL & FOOD TECHNOLOGY
1\textsuperscript{st} & 2\textsuperscript{nd} Semester

EXAMINATIONS 2014-2015

&

2\textsuperscript{nd} & 3\textsuperscript{rd} Year
EXAMINATIONS 2015

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OUTLINE OF SEMESTER WISE SYLLABUS FOR B.Sc. (MICROBIAL & FOOD TECHNOLOGY) 2014-2015

Note:
1. A student who has passed the +2 Examination under 10+2+3 system of education of a recognized university/Board/Council or any other examination recognized by the Panjab University as equivalent thereto shall be eligible to offer the subject of Microbial & Food Technology at the B.Sc. level, if the student has passed the +2 examination with Physics, Chemistry, Mathematics/ Biology as their subjects.
2. Only such colleges which have all necessary infrastructure of equipment and staff shall admit students to the subject of microbial and food technology. The infrastructure must be approved by the University as per usual practice.

<table>
<thead>
<tr>
<th>PAPERS</th>
<th>CODE</th>
<th>TITLE</th>
<th>M. MARKS</th>
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<tbody>
<tr>
<td>(B.Sc PART I)</td>
<td>Semester I</td>
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<tr>
<td>PAPER I</td>
<td>BMF 1001</td>
<td>General and Food Microbiology</td>
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<tr>
<td></td>
<td>BMF 1051</td>
<td>Practical</td>
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<tr>
<td>PAPER II</td>
<td>BMF 1002</td>
<td>Microbial and Food Biochemistry</td>
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<tr>
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<tr>
<td>PAPER III</td>
<td></td>
<td>Chemistry</td>
<td>150</td>
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<td></td>
<td></td>
<td>Paper A Inorganic Chemistry</td>
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<td>Paper C Physical Chemistry</td>
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<td>Paper D Practicals</td>
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<tr>
<td>PAPER IV</td>
<td>HCP/PUNJABI</td>
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| Semester II                                |
| PAPER I | BMF 1003 | Industrial Microbiology and Fermentation Technology | 100      |
|        | BMF 1053 | Practical                                           | 50       |
| PAPER II | BMF 1004 | Principles of Food Preservation and Packaging      | 100      |
|        | BMF 1054 | Practical                                           | 50       |
| PAPER III |          | Chemistry                                           | 150      |
|          |            | Paper A Inorganic Chemistry                        |          |
|          |            | Paper B Organic Chemistry                          |          |
|          |            | Paper C Physical Chemistry                         |          |
|          |            | Paper D Practical                                   | 50       |
| PAPER IV | HCP/PUNJABI |                                               | 100      |
| PAPER VI |            | Job Training: Four weeks training in a reputed Industry / Institution after B.Sc. – II\textsuperscript{nd} SEMESTER Final exams\*. |          |
| PAPER VI |            | TOTAL MARKS                                          | 600      |

IMPORTANT NOTE:
The Paper of Environment & Road Safety Education is a compulsory qualifying paper, which the students have to study in the B.A./B.Sc. 1\textsuperscript{st} year (2\textsuperscript{nd} Semester). If the student/s failed to qualify the paper during the 2\textsuperscript{nd} Semester, he/she/they be allowed to appear/qualify the same in the 4\textsuperscript{th} or 6\textsuperscript{th} Semester/s.
### B.Sc. PART II

<table>
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<th>Section</th>
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<td></td>
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<td>BMF 3002 Principles of Environmental Microbiology</td>
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<td>II</td>
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<td>BMF 3004 Food Analysis &amp; Quality Control</td>
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* Marks for job training done in B.Sc I and B.Sc II to be credited in B.Sc III
UNIT I (ENVIRONMENT)

Note: The syllabus has 15 topics to be covered in 25 hour lectures in total, with 2 lectures in each topic from 2 to 11 and one each for the topics 1 and 12 to 15.

1. Environment Concept:
   Introduction, concept of biosphere—lithosphere, hydrosphere, atmosphere; Natural resources—their need and types; principles and scope of Ecology; concepts of ecosystem, population, community, biotic interactions, biomes, ecological succession.

2. Atmosphere:
   Parts of atmosphere, components of air; pollution, pollutants, their sources, permissible limits, risks and possible control measures.

3. Hydrosphere:
   Types of aquatic systems. Major sources (including ground water) and uses of water, problems of the hydrosphere, fresh water shortage; pollution and pollutants of water, permissible limits, risks and possible control measures.

4. Lithosphere:
   Earth crust, Soil—a life support system, its texture, types, components, pollution and pollutants, reasons of soil erosion and possible control measures.

5. Forests:
   Concept of forests and plantations, types of vegetation and forests, factors governing vegetation, role of trees and forests in environment, various forestry programmes of the Govt. of India, Urban Forests, Chipko Andolan.

6. Conservation of Environment:
   The concepts of conservation and sustainable development, why to conserve, aims and objectives of conservation, policies of conservation; conservation of life support systems—soil, water, air, wildlife, forests.

7. Management of Solid Waste:
   Merits and demerits of different ways of solid waste management—open, dumping, landfill, incineration, resource reduction, recycling and reuse, vermicomposting and vermiculture, organic farming.

8. Indoor Environment:
   Pollutants and contaminants of the in-house environment; problems of the environment linked to urban and rural lifestyles; possible adulterants of the food; uses and harms of plastics and polythene; hazardous chemicals, solvents and cosmetics.

9. Global Environmental Issues:
   Global concern, creation of UNEP; Conventions on climate change, Convention on biodiversity; Stratospheric ozone depletion, dangers associated and possible solutions.

10. Indian Laws on Environment:
    Indian laws pertaining to Environmental protection: Environment (Protection) Act, 1986; General information about Laws relating to control of air, water and noise pollution. What to do to seek redressal.

11. Biodiversity:
    What is biodiversity, levels and types of biodiversity, importance of biodiversity, causes of its loss, how to check its loss; Hotspot zones of the world and India, Biodiversity Act, 2002.
12. **Noise and Microbial Pollution:**
   Pollution due to noise and microbes and their effects.

13. **Human Population and Environment:**

14. **Social Issues:**
   Environmental Ethics: Issues and possible solutions, problems related to lifestyle, sustainable development; Consumerisms and waste generation.

15. **Local Environmental Issues:**
   Environmental problems in rural and urban areas, Problem of Congress grass & other weeds, problems arising from the use of pesticides and weedicides, smoking etc.

**Practicals:**
Depending on the available facility in the college, a visit to Vermicomposting units or any other such non-polluting eco-friendly site or planting/caring of vegetation/trees could be taken.

**Examination Pattern:**
A qualifying paper of 50 marks comprising of fifty multiple choice questions (with one correct and three incorrect alternatives and no deduction for wrong answer or unattempted question), and of 1 hour duration.

The students have to obtain 33% marks to qualify the paper. The marks are not added/included in the final mark sheet.

**UNIT II (ROAD SAFETY)**

1. Concept and Significance of Road Safety.
2. Role of Traffic Police in Road Safety.
3. Traffic Engineering – Concept & Significance.
5. How to obtain Driving License.
7. Common Driving mistakes.
8. Significance of First-aid in Road Safety.
9. Role of Civil Society in Road Safety.

**Note:**  **Examination Pattern:**
- The Environment and Road Safety paper is 70 marks.
- Seventy multiple choice questions (with one correct and three incorrect alternatives and no deduction for wrong or un-attempted questions).
- The paper shall have two units: **Unit I (Environment) and Unit II (Road Safety).**
- Unit II shall comprise of 20 questions with minimum of 1 question from each topics 1 to 10.
• The entire syllabus of Unit II is to be covered in 10 hours.
• All the questions are to be attempted.
• Qualifying Marks 33 per cent i.e. 23 marks out of 70.
• Duration of examination: 90 minutes.
• The paper setter is requested to set the questions strictly according to the syllabus.

**Suggested Readings**

2. Road Safety Signage and Signs (2011), Ministry of Road Transport and Highways, Government of India.

**Websites:**

(a) www.chandigarhpolicenic.in

(b) www.punjabpolice.gov.in

(c) www.haryanapolice.gov.in

(d) www.hppolicenic.in
B.Sc. PART I (MICROBIAL AND FOOD TECHNOLOGY)  
SEMMESTER I

BMF 1001 – GENERAL AND FOOD MICROBIOLOGY
Max. Marks : 100
Theory : 90
Int. Ass. : 10
Time : 3 hours

Instructions for the examiner: The Question Paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: To introduce to students fundamental concepts of microbiology which includes microbial diversity, their morphological and functional properties, techniques to study microorganisms, growth and control of microorganisms as well as food spoilage and its control.

UNIT- I
1. **Introduction**: Discovery of microbial world, Importance of microbiology, Microbial classification and nomenclature, Characteristics of major groups of microorganisms: Archaeabacteria, Eubacteria, Fungi, Protozoa and Viruses and Bacteriophages.

2. **Prokaryotic cell structure and function**: Cell morphology; the capsule and slime layer; cell wall; cell membrane; ribosome; flagella; fimbriae and pilli; nuclear region and spores.

3. **Microbial Nutrition**: Nutritional requirements of microbes; Types of culture media; Classification of microbes on the basis of nutritional requirements, Identification of bacteria.

UNIT- II
4. **Bacterial Growth**: Bacterial growth curve, Methods of measurement of growth, Bacterial growth at high and low temperature; Other environmental factors affecting microbial growth, Synchronous and Diauxic growth.

5. **Control of microorganisms**:- Physical and Chemical methods of sterilization/Disinfection.

6. **Human-Microbial Interactions**: Normal flora –Gastrointestinal tract; Pathogenic mechanisms of food borne bacteria, Brief account of mechanisms of action of chemotherapeutic agents, Introduction to specific and nonspecific defense mechanisms to infections.

UNIT- III
7. **Food-borne Pathogens**: General characteristics and brief account of food borne diseases caused by- Staphylococcus aureus; Clostridium botulinum; C. perfringen; Listeria monocytogene; Salmonella; Escherichia.coli; Yersinia enterocolitica; Vibrio parahaemolyticus, Mycotoxins.

UNIT- IV
8. **Food Spoilage**: Contamination of foods from natural sources, Intrinsic and Extrinsic parameters of food that affect microbial growth, Associations of microorganisms involved in spoilage, Physical and Chemical changes in food caused by micro-organisms.


REFERENCE BOOKS
5. Pelczar, Reid and Chan, 2008, Microbiology, McGraw Hill Ed, ND
BMF 1002 – MICROBIAL AND FOOD BIOCHEMISTRY

Max. Marks : 100
Theory : 90
Int. Ass. : 10
Time : 3 hours

Instructions for the examiner: The Question Paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: The paper provides basic information on chemical, physical and functional properties of various biomolecules present in food and how they contribute to the overall quality of foods.

UNIT- I
1. Introduction to Biomolecules: Major and minor constituents of food, Bioavailability of nutrients, their functions, sources, Basics of bioenergetics.
2. Enzymes: Enzymes classification and nomenclature; coenzymes, cofactor, kinetics, factors affecting catalytic efficiency of enzymes, allosteric enzymes, feed back inhibition; Competitive and non competitive inhibition.

UNIT- II
3. Carbohydrates: Classification, structure & properties, Catabolism of carbohydrates- glycolysis, TCA, electron transport chain, Pentose phosphate pathway, Entner Doudoroff pathway, Fermentation, Anaerobic respiration; artificial sweeteners.
5. Lipids: Classification, Structure and functions- saturated, unsaturated and phopholipids, Catabolism of fatty acids- Alpha and Beta oxidation pathways.

UNIT- III
6. Biosynthetic Pathways: Brief account of Biosynthesis of sugars and polysaccharides, amino acids, nucleotides, fatty acids and lipids in prokaryotes, biosynthesis of bacterial cell wall.
8. Vitamins and minerals: Classification, sources and functions.

UNIT- IV
10. Flavours: Definition and basic taste factors, chemistry of food flavors from cocoa, coffee, vanilla beans and spices, flavor changes in fats and oil, flavor and aroma’s of food.
11. Changes in food constituents during processing: Changes in carbohydrates on cooking, Browning and Maillard reactions, Effects of physio-chemical conditions on proteins, Denaturation of proteins, Oxidative and Hydrolytic Rancidity.

REFERENCE BOOKS:
5. De, Amit Krishna., 2012, Biochemistry, S.Chand & Co. Ltd., New Delhi, India.
PRACTICALS

BMF 1051 – (GENERAL AND FOOD MICROBIOLOGY)  
Max. Marks : 50  
Int. Ass. : 5  
Time : 3 hours

1. Introduction and study of microbiological instruments.  
2. Media preparation, aseptic techniques and transfer of microorganisms.  
3. To study various culture techniques.  
4. Microscopy: study, use and care of compound microscope.  
5. To study effect of chemical disinfectants on bacterial growth by filter paper disc method.  
6. To study morphology of bacteria by simple staining and negative staining.  
7. Principle, procedure and use of gram staining method.  
8. Staining of bacterial spores.  
9. To distinguish the growth characteristics of microorganisms in various differential and selective media.  
10. Identification of fungi by Lactophenol cotton blue staining method.  
11. Sampling and observation of microorganisms from natural sources.  
12. To study serial dilutions of the sample and plate counts.  
13. To perform antibacterial testing by Kirby-Bauer method.  
15. Presumptive coliform test for milk, butter and ice-cream.  
16. Yeast and mold count for butter and dahi.

BMF 1052 (MICROBIAL AND FOOD BIOCHEMISTRY)  
Max. Marks : 50  
Int. Ass. : 5  
Time : 3 hours

1. Qualitative analysis of carbohydrates.  
2. Qualitative analysis of amino acids.  
3. Determination of pH and pI values of an amino acid.  
5. Quantitative estimation of amino acids by ninhydrin.  
6. Determination of acidity and pH of food product.  
7. Determination of Protein by kjeldhal method.  
9. Determination of acid value in given oil.  
10. Determination of melting points of different types of oils.  
15. Determination of ash content and different types of ash.
gzikph (bk:wh)  
शमेस्त्र धारित

प्रतिशत

1. अपुष्तिय पंसागी बदशर ए अपिनेय 10 अंक
2. पंसागी बराटियों ए अपिनेय 10 अंक
3. बहे-सीढ़ीं ए अपिनेय 10 अंक
4. T[go'es fszBK g[[[;seK d/ nkXko T[Zs/ bx] T][ZsoK tkb/ gqôB 20 अंक
5. सेण्ड वर्तना 20 अंक
6. संगठ वर्तना/समर्थन हितो 10 अंक
7. gqpzXeh öpdfkबठी 10 अंक

शैली

1. वर्षि-पुष्ठि, (zgkde) vka eowihs f;zx, gpbhe/ôB fpT[o', gzikp :{Bhtof:Nh, uzvhrVQ (शिव डैं हे उंद वांडी)
2. वर्षि वराटि, (zgkde) vka XBtzs e"o, gpbhe/ôB fpT{o', gzikp :{Bhtof:Nh, uzvhrVQ (शिव डैं हे उंद वराटियों)
3. जाति विचारहर दरि पट, iDikok p/dh, e:s{oh bkb n?Av :zB÷, nzfwqs:o (शिव डैं हे अपिताण हर उंद)
4. 1, 2 ns/ 3 g{;seK d/ gkm-eqw s/ nkXkos bx] T[ZsoK tkb/ gqôB

पुरुषत अने वीभ

1. वर्षि संगठित विचरे पुरुषा महिण चिंताधिकव (े दिखि दिख) 10 अंक
2. वराटि-संगठित विचरे विज्ञ पुरुषा महिण चिंत (े दिखि दिख) 10 अंक
3. संगठि-सीढ़िय धुमर विचरे विज्ञ पुरुषा महिण चिंत (े दिखि दिख) 10 अंक
4. ekft:zrzqfj, ejkJh:-zrzqfj s/ ;?ihtBh fu't'A bx{ gqôBK d/ T[Zso (15 fu't'A 10 gqôB, T[Zso e/tb fJe ;so fu't) 10 x 2 = 20 अंक
5. सेण्ड वर्तन (500 öpdfK fu't) Gkôk, gzikph :fGnkuko s/ ihtB doôB Bkb :zpZXs (uko ftfônK ftZu'A fe/ fJe ftô/ pko/) 20 अंक
6. संगठ वर्तन 10 अंक
7. gqpzXeh öpdfkthb (12 fu't'A fe/ 10 öpdfK dk gzikph o(g) öpd ;uh Bkb BZEh j?) 10 अंक
आर्थिक युक्ति:

1. उद्देश्य सिद्ध (अ.), क्रस्त वेदना हर्षित, धन पर्स युद्धक्षत्रानी टॅक्सत खुंब बेंड, चंडीगढ़
2. सृष्टि क्रिया सिद्ध पृष्ठ (अ.), gizikph Gkôk jsfrnkB, gizikph Gkôk nekdwh, ibzXo, 1997H
3. समस्त वशवानी, धन्यशील हर्षित वेदना हर्ष वंच, oth ;kjsx gqekôB, jkb pk÷ko, nzfws;ô, 2012H
4. धन्यशील हर्षित वेदना हर्षित, धन पर्स युद्धक्षत्रानी टॅक्सत खुंब बेंड, चंडीगढ़।
5. वहन, पुस्ता सिद्ध (अ.), धन्यशील हर्षित, निर्माण अनुसूची बिंदु उद्देश्य, u/sBk gqekôB b[fxnkDk, 2008H
6H Xkbbhtkb, gq/w gqekô f;zx (vkH), f;Xkse Gkôk jsfrnkB, wdkB gpfbeêôB÷, gfNnkbk, 2002.
7. अनुसूची पाड़, बेंड, gfookjJe Gkôk jsfrnkB, dhge gpfboô÷, ibzXo, 1981H

B’NL 1H N?c;N bJh jøs/ d/ S/ ghohnv.
2H ezg’ihôB bJh 25-30 ftfndkoEhnK dk ro|Zg ns/ jøs/ d/ fszB j’o ghohnv.
3H jøs/ d/ 6O3&9 ghohnv.

1. Ability जेन्द्र
2. Absolute पूर्त
3. Access पूर्त
4. Accountable ट्रिउत्तर्फी, नस्तर्पेत्र
5. Accuracy स्थुमज्जी
6. Acknowledgement पूर्त कमीश
7. Action वाव्यापी
8. Adhoc उच-अवध
9. Administration gqôk;B
10. Affidavit jbøhno fpnkB
11. Allowance बॉनग
12. Amended draft मिनयब्य धवज्जा
13. Amount due घडसी वधभ
14. Answerable ट्रिउत्तर्फी
15. Appropriate ट्रिकिउड
16. Attestation उमलीव
17. Auction ठिखभी
18. Book of reference उद्देश्य पुमउव
19. Bright prospect T[3ib GfIZy
20. Broad details भेटा बेरड़ा
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51. Embezzlement öpB
52. Eminence ggf;ZXh, ;q/ömsk, wjkBsk
53. Employment exchange o"rzko e/Ado
54. Enable जेबा घटाईँगरा
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60. Evaluation भूष-भेद्द्र
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65. False claim छठा रणभान्ता
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69. Final decision nzfsw ø?;bk
70. Flexibility yue
71. Float छाप्तू वर्गरा
72. Force pb, òesh
73. Formal तान्त्री
74. Formal sanction o;wh wB÷{oh
75. Founder वर्त्ती
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111. Information  भूल, मानसिक
112. Innovation  तथ्यविद्या
113. Innocent  fBod'ô, wk;w
114. Insecure  असं-संविधान
115. Inscription  fôbkb/y
116. Insignia  चित्त
117. Insist  ö'o d/Dk, nVBk
118. Inspection  विश्वास
119. Instability  आमिरप्रणा
120. Instinct  पुष्ठिण्डी, भिन्नी
121. Institute  मेंमण
122. Instruct  उपाधिक वाक्य
123. Insurance  बीमा
124. Insurance premium  phwk feôs
125. Isolate  दूर करना, भर्ती वाक्य
126. Joint director  मेंमुख डकितेरसम
127. Judicial  अदालती, लिङ्गीय
128. Judgement  ø?;bk, fBoDk
129. Knowledge  गच्छात, मानसिक
130. Laboratory  gq:'rôkbk
131. Land tax  भू-वात
132. Land mark  मीमा-चित्त
133. Language department  Gkôk ftGkr
134. Lawful  ekùB nB];ko
135. Lay out  ökek
136. Leave allowance  बूटी बूढ़ा
137. Ledger  öksk tjh
138. Ledger folio  öksk gzBk
139. Legal aid  ekùBh ;jkfJsksk
140. Legal document  ekùBh d;skt/♀
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OR
HISTORY AND CULTURE OF PUNJAB

INSTRUCTIONS FOR THE PAPER –SETTER AND CANDIDATES: (FOR PAPER in Semester 1 and 2) (6 Credit course)

1. The syllabus has been divided into four Units.
   There shall be 9 questions in all. The first question is compulsory and shall be short answer type containing 15 short questions spread over the whole syllabus to be answered in about 25 to 30 words each. The candidates are required to attempt any 9 short answer type questions carrying 18 marks i.e. 2 marks of each. Rest of the paper shall contain 4 units. Each Unit shall have two essay type questions and the candidate shall be given internal choice of attempting one question from each Unit-IV in all. Each question will carry 18 marks.

2. For private candidates, who have not been assessed earlier for internal assessment, the marks secured by them in theory paper will proportionately be increased to maximum marks of the paper in lieu of internal assessment.
   The paper-setter must put note (2) in the question paper.

3. One question from Unit-IV shall be set on the map.

Explanation:
1. Each essay type question would cover about one-third or one-half of a topic detailed in the syllabus.
2. The distribution of marks for the map question would be as under:
   Map : 10 Marks
   Explanatory Note : 08 Marks

   In case a paper setter chooses to set a question of map on important historical places, the paper setter will be required to ask the students to mark 5 places on map of 2 marks each and write explanatory note on any four of 2 marks each.

3. The paper-setter would avoid repetition between different types of question within one question paper.

Paper 1: Max. Marks : 100
Theory : 90
Internal Assessment : 10
Time : 3 Hours

Objectives: To introduce the students to the history of Punjab region.
Pedagogy: Lectures, library work and discussions.

UNIT I
2. Vedic Age: socio-economic life; development of caste; position of women.
3. Religion: vedic religion; impact of Buddhism and Jainism on the region.
UNIT II
4. **Society and Culture c. 1000 A.D.:** Socio-economic life; religious life; education
5. **Cultural Reorientation:** main features of Bhakti; origin and development of Sufism
6. **Society and Culture C. 1500A.D:** socio-economic life under the Lodhis; religious beliefs and practices- Vainavism, Shaivism, Shaktism, Islam.

UNIT III
7. **Sikhism:** new ideology of Guru Nanak; evolution of Sikh community- guruship, manji, masand; new institutions- gurdwara, sangat-pangat.
8. **Transformation of Sikhism:** martyrdom of Guru Arjan; martyrdom of Guru Tegh Bahadur; impact.
9. **Institution of Khalsa:** new baptism; significance

UNIT IV
10. **Changes in Society:** social unrest; emergence of new rulers-rakhi, gurmata, dal khalsa.
11. **Society and Culture under Maharaja Ranjit Singh:** social mobility; painting and architecture; literature.
12. **MAP: Major Historical Places:** Harappa, Mohenjodaro, Sanghol, Ropar, Lahore, Amritsar, Kiratpur, Anandpur Sahib, Tarn Taran, Machhiwara, Goindwal, Khadur Sahib.

**Suggested Readings:**

5. Basham, A.L : The Wonder That was India, Rupa Books, Calcutta (18th rep.), 1992
7. Singh, Kirpal : History and Culture of the Punjab, Part II (Medieval Period), Publication Bureau, Punjabi University, Patiala 1990 (3rd edn.).


Note: The following categories of the students shall be entitled to take option of History & Culture of Punjab in lieu of Punjabi as compulsory subject:

A. That the students who have not studied Punjabi upto class 10th.
B. Ward of / and Defence Personnel and Central Govt. Employee/Employees who are transferrable on all India basis.
C. Foreigners
SECOND SEMESTER

BMF 1003 – INDUSTRIAL MICROBIOLOGY & FERMENTATION TECHNOLOGY

Max. Marks : 100
Theory : 90
Int. Ass. : 10
Time : 3 hours

Instructions for the examiner: The Question Paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: To provide an insight into the basic principles of Fermentation Technology and Downstream Processing which involves strain selection, media formulation, sterilization, inoculum development, design of bioreactors and product recovery. Paper also deals with production and use of various fermented products

UNIT- I
1. Introduction: Importance of fermentation technology, Basic steps of industrial fermentation; Primary and Secondary metabolites.
2. Industrially important microbes: Industrially important microbes; Isolation, Screening, Improvement and Preservation of Industrial microorganisms.
3. Fermentation media and inoculum development: Medium formulation and common substrates used in fermentation industry; Methods of media sterilization, Inoculum preparation for microbial fermentations.

UNIT- II
4. Fermentation: Types of fermentations- Aerobic and anaerobic fermentation, Submerged and solid state fermentation, Batch and Continuous fermentation systems.
5. Design of Fermenter: Design and types of fermenter, antifoam agents, sterilization of fermenter, Basic Control Panels (aeration, agitation, pH and temperature).
6. Downstream Processing of industrial fermentations: General procedures for recovery and purification of products- separation of biomass and insolubles; cell disruption and recovery and purification.

UNIT- III
7. Alcoholic beverages and Solvent: Industrial production of Beer, Wine and Ethanol
8. Organic acids: Acetic Acid, Citric Acid, Lactic acid.

UNIT- IV
11. Microbial Enzymes: Industrial production of microbial enzymes-amylase and protease; Immobilization of enzymes and their applications.

REFERENCE BOOKS
BMF 1004 - PRINCIPLES OF FOOD PRESERVATION AND PACKAGING

Max. Marks : 100
Theory : 90
Int. Ass. : 10
Time : 3 hours

Instructions for the examiner: The Question Paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: The paper deals with different methods of food processing and preservation methods, recent advances and food packaging concepts.

UNIT- I
1. Introduction: General principles of food preservation, Historical development.
2. Preservation by Heat: Heat transfer, Heat treatments – Blanching; Pasteurization; Sterilization; Boiling and Canning; TDT Curve, D value, F value, 12D concept.
3. Refrigeration & Freezing of foods: Differences between - refrigeration and freezing; Effect of refrigerated and frozen storage on food; Immersion freezing.

UNIT- II
4. Preservation by Drying: Drying curve, Factors affecting drying, Methods of drying & dehydration - Air convection dryers; Fluidized bed drier; roller drier; vacuum drier; spray drier; Freeze – Drying, Intermediate Moisture foods.
5. Preservation by Concentration: Methods of concentration, Types of Evaporators.
6. Preservation by Radiations: Types of Radiations, Effects of Radiations, Dose – Determining Factors, Status of Irradiated foods in India, Microwave, Ohmic heating.

UNIT-III
8. Recent Trends in Food Processing: Overview of Extrusion cooking, Reverse Osmosis, Electrodialysis, Ultrafiltration, High Pressure Processing, Pulse electric field preservation.

UNIT- IV
11. Packaging Methods: Form fill seal packaging, Hermetic closures, Retortable pouches, Aseptic packaging, Inert gas packaging, Active & Intelligent Packaging, vacuum packaging, CAP and MAP.
12. Packaging of Food Products: Description of packaging of -
   a) Frozen products
   b) Dried products
   c) Chemically preserved foods
   d) Fats and oils
   e) Confectionery and bakery
   f) Fruit juices
   g) Heat processed foods
   h) Fresh produce (Eggs, Meat, Fruits and Vegetables)

REFERENCE BOOKS –
1. Jood, Sudesh, 2009, Food Preservation, Agrotech Publisher Academy, Udaipur.

PRACTICALS

BMF 1053 – (INDUSTRIAL MICROBIOLOGY & FERMENTATION TECHNOLOGY)

1. Screening of microbes producing industrially important enzyme.
2. Maintenance and preservation of pure culture.
3. Determination of cell biomass.
5. To study the effect of energy source and role of buffers on the growth of microbes.
6. To study the effect of temperature and pH on the growth of microbes.
7. To study the effect of aeration and substrate concentration on the growth of bacteria.
8. Isolation of LAB in pure culture.
11. To study solid state and submerged fermentation techniques.
12. To study probiotic bacteria.
13. Lab scale production of an enzyme.
14. Lab scale preparation of ethanol.
15. Study of Cell/enzyme immobilization techniques.

BMF 1054 – PRINCIPLES OF FOOD PRESERVATION AND PACKAGING

1. To blanch a seasonal fruit or vegetable & assess quality of blanching process.
2. To study the effect of browning on raw fruits & vegetables.
3. Preparation of drying curve.
4. To study effect of heat and acidity on milk proteins.
5. To study the effectiveness of pasteurization by phosphatase test.
6. To study Pasteurization of milk using microwave technique.
7. To study the different packaging materials
8. Determination of water vapour transmission rate for various packaging materials.
9. To determine grease resistance of packaging material.
10. To determine the wax content in given wax paper.
11. To estimate the basis weight of given packaging material.
13. Determination of uniformity of tin coating and tin crystal size on given tin plate.
14. To study the effect of addition of different chemical preservatives on food quality.
15. To study the synergistic / antagonistic combination of GRAS additives.
ग्झिक्ह (bk:w)  
नमेसट ज्ञान

1. अपूर्ण फैलवी जबड़ ए आकेश 10 अंच
2. फेरवी वार्षिकं ए आकेश 10 अंच
3. मदी-नीती ए आकेश 10 अंच
4. न्यूमेन दिण लेटिन 20 अंच
5. विश्वविद्यालय: फिरां जे फिरां 12 अंच
6. ज्ञानकोश 8 अंच

वेजम

1. नाम-सुनाम, (माध्यम) या विनय, विषबहे/बफ fpT{o', gzikp :{Bhtof;Nh, uzvhrVQ (म्रूं ते वाण उद वड़ी)
2. वाक्य बनाओं. (ङ्गक्ष) vka XEtics e'o', gpbhē/बफ fpT{o', gzikp :{Bhtof;Nh, uzvhrVQ (म्रूं ते वाण उद बनाने)  
3. जानकी विश्वविद्यालय ठूँढ़ ठूँढ़, बटामंगे बटामे, e;¢{oh bkb n?Av ;ZB+, nzfwq:o (7 ते 12 अपितांत उद)
4. 1, 2 ns/ 3 g;seK d/ gkm-eqw s/ nkXkos bx{ T[ZsoK tkb/ gqôB

पुरुषतर अंगे दीर्घ

1. वार्षिक संवार्थ बिचं धुमंगा मरिउट विश्लिष्टा (ईं बिचं दिलव)
2. बरोड़ी-संवार्थ बिचं बिमें दिल बरोडं रा मान (ईं बिचं दिलव)
3. मदी-नीती प्रजाबंध बिचं बिमें दिल बांडर/बांडर रा मान (ईं बिचं दिलव)
4. ekft:-zqrff, ekjh:-zqrff s/ t?=ihlBh ftu'A bx{ gqôBK d' T[Zso (15 ftu'A 10 gqôB, T[Zso e/tb ftL e;so ftu) 10 x 2 = 20 अंच
5.  
6. (X[Bh L X[Bh dh gfoGkōk, yzv s/ nyzv  
7. भुङडफ्य अंत एं बेव घटिणी (दिल बिचं बंटी एं बताउँे)
1. उद्योग सिप्स (ख्र.), विद्यालय प्रबंधक विभाग, पंतप्रधान पुरुषौलिमीटी टैयमेट शंघ वेदट, चंडीगढ़
2. विद्यालय सिप्स (ख्र.), गबिक़ गको मुक्त नेक्स्क, गजिक पूर्वी फ्लैट, चंडीगढ़, 1997H
3. संस्थान विद्यालय, उत्तर प्रदेश प्रबंधक विभाग दे चुंच धन, oth :किज़ औटचो, जिब प्यु-सो, नजफ्वासो, 2012H
4. पंतप्रधान वेदनाथ विश्वसंदेह, पंतप्रधान पुरुषौलिमीटी टैयमेट शंघ वेदट, चंडीगढ़।
5. बनध, भुन्त सिप्स (ख्र.), पंतप्रधान विभाग, निष्पादन अनुसार विभाग, u/sBk गोटकोब břlixirDk, 2008H
6. Xkbkthk, gq/w गको f:x (vkH), f:XMsd Gkōk ffrnkB, wdkB gpfbe/ोB-, gNnkba, 2002H
7. अप्रिलपूर्वी, बंध, gfouk|Je Gkōk ffrnkB, राजधानी विोलौ-ए, इब्बा, 1981H

हेड़: 1. न्:न जोस/ द/ झोन्न।
2. ezg'ihोब बीज 25-30 फ्लोन्कोः हेनक dक रो[Zg न्स/ जोस/ द/ फ्झब जो झोन्न।
3. जोस/ द/ 603+9 वैदिक्ष।
HISTORY AND CULTURE OF PUNJAB

INSTRUCTIONS FOR THE PAPER –SETTER AND CANDIDATES: (FOR PAPER in Semester 1 and 2) (6 credit course)

1. The syllabus has been divided into four Units.

There shall be 9 questions in all. The first question is compulsory and shall be short answer type containing 15 short questions spread over the whole syllabus to be answered in about 25 to 30 words each. The candidates are required to attempt any 9 short answer type questions carrying 18 marks i.e. 2 marks of each. Rest of the paper shall contain 4 units. Each Unit shall have two essay type questions and the candidate shall be given internal choice of attempting one question from each Unit-IV in all. Each question will carry 18 marks.

2. For private candidates, who have not been assessed earlier for internal assessment, the marks secured by them in theory paper will proportionately be increased to maximum marks of the paper in lieu of internal assessment.

The paper-setter must put note (2) in the question paper.

3. One question from Unit-IV shall be set on the map.

Explanation:
1. Each essay type question would cover about one-third or one-half of a topic detailed in the syllabus.

2. The distribution of marks for the map question would be as under:

   Map : 10 Marks
   Explanatory Note : 08 Marks

   In case a paper setter chooses to set a question of map on important historical places, the paper setter will be required to ask the students to mark 5 places on map of 2 marks each and write explanatory note on any four of 2 marks each.

3. The paper-setter would avoid repetition between different types of question within one question paper.

   Paper 1: Max. Marks : 100
              Theory : 90
              Internal Assessment : 10
              Time : 3 Hours

   Objectives: To introduce the students to the history of Punjab region in Modern times.

   Pedagogy: Lectures, library work and discussions.
UNIT I
1. Introduction of Colonial Rule: administrative changes; means of communication; western education.
2. Agrarian Development: Commercialization of agriculture; canalization and colonization.
3. Social Classes: agrarian groups; new middle classes

UNIT II
5. Socio Religious Reform Movements: activities of Arya Samaj; Singh sabhas; Ahmadiyas.
6. Development of Press & literature: growth of press; development in literature

UNIT III
7. Emergence Of Political Consciousness: Agrarian uprising 1907; Ghadar.
8. Gurudwara Reform Movement: Jallianwala Bagh; foundation of SGPC and Akali Dal; Morchas.
9. Struggle for Freedom: activities of revolutionaries - Babbar Akalis, Naujawan Bharat Sabha; participation in mass movements – non co-operation, civil disobedience, Quit India.

UNIT IV
10. Partition and its Aftermath: resettlement; rehabilitation
12. MAP: Major Historical places: Delhi, Kurukshetra, Jaito, Ferozepur, Ambala, Amritsar, Lahore, Ludhiana, Qadian, Jalandhar, Lyallpur, Montgomery.

Suggested Readings:
1. Singh, Kirpal: History and Culture of the Punjab, Part II(Medieval Period), Publication Bureau, Punjabi University, Patiala 1990(3rd edn.).
B.Sc. 2nd Year (MICROBIAL AND FOOD TECHNOLOGY)

I. RECOMBINANT – DNA TECHNOLOGY & BIOANALYTICAL TECHNIQUES

BMF 2001 – MICROBIAL GENETICS & r-DNA TECHNOLOGY

Max. Marks : 75
Theory : 67
Int. Ass. : 8
Time : 3 hours

Instructions for the examiner: The Question Paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: To make the students understand the fundamental concepts of genetics which includes DNA structure, replication, transcription, translation, mutation, gene regulation and techniques related to genetic engineering.

UNIT-I
1. Genetics of bacteria and its application to health and agriculture.
2. Genome organization in prokaryotes: Molecular nature of the genetic material, Composition and structure of prokaryotic DNA and RNA.
3. DNA Replication: DNA replication mechanism in prokaryotes, enzymes involved in DNA replication, theta and sigma modes of replication.

UNIT-II
4. Gene Expression: Overview of central dogma, Transcription in bacteria, characteristics of the genetic code, structure and charging of tRNA, mechanism of translation process.
5. Mutations: Spontaneous and induced mutations, types of point mutations, mutagenic agents, repair of DNA damage, Replica plating, Transposable elements in bacteria.
7. Gene Regulations: Regulation of gene expression in response to environmental conditions, Operon concept- the Lactose and the Tryptophan operon.

UNIT-III
8. DNA Transferring Mechanisms: CaCl₂ method, biolistic gun, Electroporation, phage transfection.
10. Genes to clones: Basic techniques used to identify, amplify and clone genes; construction of genomic and cDNA libraries and screening of DNA libraries.

UNIT-IV
11. DNA amplification: PCR, its types and applications.
12. Techniques of molecular genetics: Southern blotting, northern blotting, western blotting, Sanger’s dideoxy chain termination and Maxam-Gilbert method of DNA sequencing, site directed mutagenesis.
13. Applications of Recombinant DNA Technology in food and health.

REFERENCE BOOKS:
Malacinski, George M., 2005, Freifelder’s. Essentials of Molecular Biology, Narosa Publishing House, ND.
Karp, Gerald, 2005, Cell and Molecular Biology, Wiley International, USA.
Snusted and Simmons, 2006, Principles of genetics, John Wiley and Sons, Inc
Weaver R.F., Molecular biology (2005), McGraw hill publisher.
BMF 2002 – BIOANALYTICAL TECHNIQUES

Max. Marks : 75
Theory : 67
Int. Ass. : 8
Time : 3 hours

Instructions for the examiner: The Question Paper will have four sections. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: The paper is designed to impart knowledge on basic principle, types, technique and applications of various analytical instruments viz chromatography, electrophoresis, spectroscopy etc.

UNIT-I
2. Electrophoresis: Principle of Electrophoresis, Theory, Techniques and applications of Paper Electrophoresis, Disc and Zone Electrophoresis and Gel Electrophoresis for protein, Nucleic acid and Capillary Electrophoresis.

UNIT-II
4. Polarimetry: Basic principle, Different Components of Polarimeter and its applications
5. Electrometric determinations: Electrochemical cells; Reference Electrodes- Colonel, Ag/AgCl Electrodes; Indicator Electrodes- Glass Membrane, Solid State Sensors, Liquid Membrane, Gas Sensing and Enzyme Electrodes, Pulse electric field, Applications.

UNIT-III
7. Fluorescence spectroscopy: Fluorescence methods, filter fluorometers, Fluoroscence Spectrophotometer

UNIT-IV
9. Atomic absorption and emission spectroscopy: Principle, Different types, Instrumentation and applications of atomic absorption and Emission Spectroscopy
10. Radio-active tracer techniques: Radioactive isotopes, Types of Radioactive decay: Decay by Negatron, positron, alpha particles emission, Radioactive Decay energy, Rate of Radioactive Decay, Units of radioactivity, Types and its Instrumentation of Detection and measurement of Radioactivity and applications of Radioisotopes in Biological sciences.

REFERENCE BOOKS:
SECTION A (MICROBIAL GENETICS & R- DNA TECHNOLOGY)
Laboratory emphasis is on the techniques used in bacterial mutagenesis, genetic exchange, gene mapping, and gene cloning.

1. Preparation of reagents involved in DNA work.
2. Isolation of plasmid DNA.
3. Preparation and running of agarose gel and detection of DNA and RNA on the gels.
4. Isolation of genomic DNA.
5. Restriction enzyme cutting of DNA.
6. Isolation of nutritional mutants.
7. Preparation of competent cells.
8. CaCl₂ transformation of plasmid and screening for positive transformants.
9. Isolation of mutant by U.V. or a chemical mutagen.
10. Quantitative estimation of DNA.

SECTION B (BIOANALYTICAL TECHNIQUES)
1. Determination of molar absorption coefficient of L-tyrosine
2. Estimation of proteins by biuret method.
3. Estimation of total sugars by anthrone method.
5. Separation of amino acids by paper electrophoresis.
7. Separation of plant pigments by TLC.
8. Separation of lipids by TLC.
12. Estimation of total serum cholesterol by zak & henly’s method
15. To study the effect of ultraviolet light on Vitamin A.
PAPER II – FOOD PROCESSING TECHNOLOGY

BMF 2003 PROCESSING OF FOODS OF PLANT ORIGIN

Max. Marks : 75
Theory : 67
Int. Ass. : 8
Time : 3 hours

Instructions for the examiner: The Question Paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: To introduce to students to post harvest processing of fruits, vegetables, cereals, pulses and oil seeds, FPO standards of processed fruit and vegetable products, preparation of processed foods of plant origin and their utilization.

UNIT-I

1. Physiology of ripening. Effect of physical and chemical treatments on post harvest life of fruits and vegetables, Storage and handling of fresh fruits and vegetables, Preparation of fruits and vegetables for processing, Preparation of fruit juices and pectin.
2. FPO Standards and preparation of jam, jellies, marmalades, tomato products, preserves and pickles.
3. By-product utilization of fruits and vegetable processing industry.

UNIT-II

4. Structure and composition of different grains like wheat, rice, etc. Milling of wheat. Flour quality, Technology of baking bread, biscuit, Durum wheat and pasta products, cereal based infant foods.
5. Milling and parboiling of rice, Rice bran oil, Pearling and malting of Barley, Wet and dry milling of corn.
6. Breakfast cereals – Porridge and flakes

UNIT-III

7. Nutritional value of pulses.
9. Toxic constituents of pulses, Application of enzymes in processing of cereals and pulses processing.

UNIT-IV

11. Processing of oils and fats, preparation of various products including margarine, salad dressing & mayonnaise.
12. Nutritional food mixes from oilseeds – Oilseeds for food use

REFERENCE BOOKS:
BMF 2004 PROCESSING OF FOODS OF ANIMAL ORIGIN

Max. Marks : 75
Theory : 67
Int. Ass. : 8
Time : 3 hours

Instructions for the examiner: The Question Paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: The paper provides an insight to milk composition, milk processing techniques, milk products, meat structure and processing as well as egg and fish technology.

UNIT-I
1. PFA Definition of milk; Chemical composition of milk of different species i.e. Buffalo, Cow (foreign), Cow (sindhi), Goat, Murrah, Jersey.
2. Diagrammatic representation of milk constituents; Factors affecting milk composition. Physico - chemical properties of milk, Production, distribution and storage of liquid milk
3. Processing of different types of market milk – Pasteurized, Sterilized, Homogenized, Flavored, Single and Double Toned milk and Humanized milk.

UNIT-II
4. Definition, composition and technology of milk products –
   a. Butter.
   b. Ghee.
   c. Ice cream.
   d. Evaporated and condensed milk.
   e. Dried milk.
6. Cheese – Definition, composition and types of cheese; Basic steps in cheese making; Cheddar cheese, Blue cheese, Mozzarella cheese and Processed cheese.

UNIT-III
7. Chemistry and microscopic structure of meat tissue; Meat pigments and color changes.

UNIT-IV
12. Nutritional value of fish; procurement of fish. Canning of fish and fish products; Spoilage in canned fish. Fish products – Fish oil, Fish flour, Fish sauce, Dried fish meal and Fish protein concentrates.

REFERENCE BOOKS :
BMF 2052 PRACTICALS

Max. Marks : 50
Int. Ass. : 5
Time : 3 hours

SECTION A (PROCESSING OF FOODS OF PLANT ORIGIN)
1. Estimation of Ascorbic Acid content spectrophotometrically.
2. Determine Brix : Acid ratio of fruits and vegetable products.
3. Preparation of fruit juice concentrate and powder.
4. Preparation of jellies and marmalades.
5. To study the physical characteristics of cereals.
7. Estimation of WAP and Gluten content of wheat flour.
8. Estimation of particle size of different types of flour.
9. Determination of physical characteristics (Specific gravity, Refractive index & Melting point ) of Peanut Butter.
11. Determine Acid Value of a given oil sample.
12. Qualitative and Quantitative determination of oil rancidity.
13. Cup test for Soluble Coffee powder.
15. Determination of oil absorption during deep-oil frying of foods

SECTION B (PROCESSING OF FOODS OF ANIMAL ORIGIN)
1. To check the heat stability of milk by COB and Alcohol tests.
3. Determination of specific gravity, SNF % and TS% of milk.
4. Estimate the milk fat by Gerber method.
5. To determine the Casein content of the milk.
6. To check the sterility of milk by Turbidity test.
7. Bacteriological estimation of milk by MBRT.
8. Physical and chemical analysis of milk & milk products
9. To estimate the salt content in butter.
11. To estimate the purity of ghee by Baudouin test.
12. Testing the adulteration in milk & milk products
13. Preparation of Ghee by different methods.
14. Quality of egg & egg powder, egg preservation.
15. Evaluation of quality of meat, fish & poultry
B.Sc. 3rd Year (MICROBIAL AND FOOD TECHNOLOGY)

PAPER I BIOINFORMATICS & ENVIRONMENTAL MICROBIOLOGY

BMF 3001: PRINCIPLES OF BIOINFORMATICS

Max. Marks : 75
Theory : 67
Int. Ass. : 8
Time : 3 hours

Instructions for the examiner: The Question Paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: To learn basic concepts of statistics, computers and required manipulation of DNA/protein sequence data and learn genetic code.

UNIT-I
2. Protein Structure classification: SCOP, CATH; Protein secondary structure prediction methods: Ab-initio prediction methods, homology based methods, prediction using neural networks; Protein tertiary structure prediction methods: Ab initio, homology modeling, threading & fold recognition.

UNIT-II
4. Query Language and Query Optimization: Domain types in SQL, Schema definition in SQL. Type commands, SQL Operators, Tables, Views, Indexes, aggregate functions, insert, delete and update operations, join, union, intersection, minus etc. in SQL queries, sub-queries, equivalence of queries.

UNIT-III
5. Introduction to bioinformatics: Introduction, overview and needs of bioinformatics technology.
6. Sequence analysis: Introduction to sequence alignment and its applications. Pair wise sequence alignment: Concept of global and local alignment, Dot Plot, algorithm for pair wise sequence alignment (Needleman and Wunsch, Smith watterman methods)
7. BLAST: Introduction to BLAST, types of BLAST, algorithm of BLAST and interpretation of its result.

UNIT-IV
9. Primary Databases: Nucleotide sequence database (GenBank, EMBL), protein sequence database.
10. Structural Databases: Pdb, PDBsum

REFERENCE BOOKS:
BMF 3002: PRINCIPLES OF ENVIRONMENTAL MICROBIOLOGY

Max. Marks : 75
Theory : 67
Int. Ass. : 8
Time : 3 hours

Instructions for the examiner: The Question Paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: The paper basic knowledge on microbial diversity in natural sources, microbial interactions and adaptations, role of microorganism in maintenance of life on earth and in water quality

UNIT-I

2. The Habitat and its microbial inhabitants: Microbial populations of soil, air and water environment. Characteristics and stratification of atmosphere, lake, ocean and soil.
3. Microbial Community Dynamics: Population selection in community, succession within microbial community- Primary and secondary succession, autotrophic and heterotrophic succession, causes and examples of succession, Homeostasis.

UNIT-II


UNIT-III

7. Quantitative Microbiology: Sampling procedures and devices, Measurement of Microbial Numbers, Biomass and Activities.
9. Bioconversions and Bioremidiation: Role of microorganisms in Biomining and Bioleaching of ores, Biogas Production, Composting and Vermicomposting, Biodegradation of hydrocarbons.

UNIT-IV

10. Microorganisms in Waste Management: Treatment of Industrial and Municipal waste-primary,secondary and tertiary treatment, Microbial indicators of environmental pollution.
11. Microorganisms in Biological Control: Microbial control of insects, pests, weeds and other disease causing organisms.

REFERENCE BOOKS -
BMF 3051 – PRACTICALS

Max. Marks : 50
Int. Ass. : 5
Time : 3 hours

SECTION A (BIOINFORMATICS)
1. Retrieving amino acid and nucleotide sequence from sequence databases using Entrez.
2. Performing BLASTp/n and interpreting its results.
4. Finding ORF in nucleotide sequence using NCBI ORF FINDER
5. Download protein structure form PDB and visualize it using RasMol.
6. To show the use of standard input (scanf) and standard output (printf) functions.
7. To show the use of variables and keywords.
8. To show the use of arithmetic operators, relational operators logical operators, unary operators, assignment operators and conditional operators
9. To show the use of getchar, putchar, gets, puts, getch, getche.
10. To expertise branching statements like if, if-then, if-then-else
11. Using the following tables:
   - PET-OWNER (ownerID, name, phone, email, street, city, state, zip)
   - PET (petID, name, type, breed, DOB, ownerID)
12. Write SQL Statements to do the following:
   i. Write Create Table statements to create the tables shown above
   ii. Write SQL statements to add at least 3 rows to the PET-OWNER table.
   iii. Write a Sql statement to display the Name, Breed and type of all pets on file.
   iv. Write a SQL Statement to display the name, breed and type of all the pets on the file.
   v. Write a SQL statement to display the name, breed and type of all pets that are of type “dog” and the breed “poodle”

SECTION B (ENVIRONMENTAL MICROBIOLOGY)
1. Isolation of amylase producing bacteria from soil.
2. Isolation of protease producing bacteria from soil.
3. Isolation of lipase producing bacteria from soil.
4. Isolation of antibiotic producer from soil.
5. Isolation of cellulose producer from soil.
6. Isolation of phosphate solublizing microbes from soil.
7. Demonstration of rhizosphere effect.
8. Determination of TS, TDS, TSS in industrial effluent.
10. Determination of BOD of industrial effluent.
11. Determination of COD of industrial effluent.
12. Isolation of ammonifying bacteria.
15. Demonstration of Biogas production.
PAPER II  FOOD ENGINEERING AND QUALITY CONTROL

BMF 3003:  FOOD ENGINEERING

Max. Marks : 75
Theory : 67
Int. Ass. : 8
Time : 3 hours

Instructions for the examiner: The Question Paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: To educate students in different aspects of food engineering and their applications in food processing, it also deals with concepts of heat and mass transfer and food processing equipments.

UNIT-I
1. Units and Dimensions: Concept of Unit operation, Mass Energy balance, Dimensions and Units, Unit Conversion, Dimensional Analysis
2. Psychrometric chart: Dry and wet bulb temperature, HUMIDITY & RELATIVE HUMIDITY, adiabatic saturation temperature, Dew point, Information about psychometric chart
3. Refrigeration: Reverse Carnot’s cycle, Pressure enthalpy chart, temperature entropy chart, vapor compression refrigeration system, equipment’s C.O.P., Refrigeration load calculation, Application of refrigeration in food processing operations

UNIT-II
4. Freezing: Principles and methods, Different types of Freezers, Industrial problems associated of frozen storage food products
5. Introduction to Heat Transfer: Heat Transfer, modes of heat transfer, conduction through a flat wall, conduction through hollow cylinder, convective heat transfer, radiation heat transfer
6. Heat transfer Equipments and Design: Heat Transfer equipments, parallel and counter current flow heat exchangers, Logarithmic mean temperature difference, heat transfer coefficient, heat exchanger design (preliminary), concept of black body, Emissivity and Absorptivity

UNIT-III
7. Flow of fluids: Types of fluids and fluid flows, viscosity, Bernoulie’s equation and its application for measurement of flow rate Different types of pumps (Reciprocating, rotary and centrifugal pumps).
8. Evaporation: Mechanisms of vaporization, Boiling Point elevation, Different types of evaporators, Evaporation of heat sensitive materials

UNIT-IV
11. Separation processes: Principles and methods of gas absorption, Distillation, Extraction and washing, Filtration, sedimentation, sieving, centrifugation
12. Membrane Separation Processes: Separation by Sieving, Screen effectiveness; Theory of filtration, Reverse Osmosis, Nano filtration and Ultra filtration

REFERENCE BOOKS -
BMF 3004 – FOOD ANALYSIS AND QUALITY CONTROL

Max. Marks : 75
Theory : 67
Int. Ass. : 8
Time : 3 hours

Instructions for the examiner: The Question Paper will have four units. Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus. Students will attempt one question from each unit and the compulsory question. All questions may carry equal marks, unless specified.

Objectives: The paper focuses on physical, chemical, microbial and sensory analysis of food, concepts of quality control and quality management, national and international food loss and adulterants in various food products

UNIT-I

2. Physico chemical methods for food analysis:
   - Moisture & Total solids
   - Carbohydrates
   - Proteins
   - Fats
   - Fiber
   - Ash & its types
   - Minerals
   - Vitamins
   - Enzymatic methods
3. Biological methods of food analysis:
   - Standard plate count; Plate loop method; Spiral plate; Droplet technique;
   - Dye reduction; Catalase test and ELISA.
   - Testing of food for organisms such as E. coli, S. aureus, B. cereus, C. botulinum, L. monocytogenes, Salmonella & Shigella.

UNIT-II

5. Sensory assessment of food quality:
   - Appearance of food – Size, Shape & Colour.
   - Flavor of food – Taste & Smell, Subjective & Objective analysis.
   - Texture of food – Concept of Rheology & Viscosity, Subjective & Objective Analysis.
6. Sensory Tests:
   - Difference, Rating & Sensitivity tests.
   - Types of panels
   - Testing area & schedule.

UNIT-III

7. Quality control of following food products:
   - Milk & milk products
   - Oils & Fats
   - Cereal grains & flours
   - Fruits & vegetable products
   - Canned foods
   - Egg & egg products
   - Meat & Meat products
8. Adulterants and Preservatives: Common adulterants present in milk, tea, coffee, cereals, spices, oils & fats. Their analysis and analysis of common preservatives used in processed foods. Permissible limits of Preservatives.
UNIT-IV


**REFERENCE BOOKS**-

**PAPER 3052 – PRACTICALS**

Max. Marks : 50
Int. Ass. : 5
Time : 3 hours

**SECTION – A (Food Engineering)**
1. Measurement of rupture angle and angle of intergranular friction of grains and powders
2. Particle size analysis and energy requirement in comminution
3. Homogenization of milk and measurement of size of fat globules before and after homogenization
4. Coefficient of viscosity of water, milk, juices etc. by flow through a capillary tube
5. Surface tension of water by Jaeger’s method
6. Mechanical equivalent of heat by calendar and Borne’s apparatus
7. Design of piping and piping network
8. Design of conveyor system for solids
9. Drying rate curves for different wet materials
10. Study of different types of heat exchangers
11. Food Plant Design and preparation of layout
12. To solve problems based on Psychometric chart
14. To study different components of refrigeration system.
15. To study thermal properties of foods.

**SECTION-B (Food analysis and Quality Control)**
1. Detection of different type of sugars in fruit juices by TLC
2. Testing of given canned product
3. Shelf life testing of packaged product by HVP method
4. Proximate analysis of Butter
5. Determination of Fructose by Roe’s Resorcinol Method.
6. Colorimetric determination of Crude Protein (Kjeldahl Nitrogen).
10. Determination of Fat by Majonnier method.
11. Determination of preservatives in milk.
12. Determination of adulterants in milk, oils & Fats, spices, Tea and Coffee
13. Estimation of Vitamin C spectrophotometrically
14. To prepare a chart of specifications for different Food products as specified by BIS
15. Determine the Critical Control Points for production line of Milk, Fruits & Vegetables and Meat industry as per HACCP system.

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