FACULTY OF SCIENCES

Department of Food Science Quality Control and Microbiology

B.Sc. Medical (Semester I - II)

(Under Credit Based Continuous Evaluation Grading System)

B.Sc. Medical (Semester III - VI)

(Under Continuous Evaluation System)

(12+3 System of Education)

Session: 2023-24

The Heritage Institution
KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)

1. Syllabus of Food Science and Quality Control for B.Sc. Medical (Sem I-VI)
2. Syllabus of Microbiology for B.Sc. Medical (Sem I-VI)

FACULTY OF SCIENCES

Syllabus

Of

Food Science and Quality Control

For

B.Sc. Medical (Semester I - II)

(Under Credit Based Continuous Evaluation Grading System)

B.Sc. Medical (Semester III - VI)

(Under Continuous Evaluation System)

(12+3 System of Education)

Session: 2023-24

The Heritage Institution

KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)

KanyaMahaVidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-I (SESSION 2023-24)

Bachelor of Sciences (Medical) Semester-I												
Course Name	**Course code**		**Paper**	**Course Type**	**Hours Per Week**	**Credits**	**Total Credits**	**Marks**				**Examination time (in hours)**
								Ext.				
						L-T-P		**L**	**P**	**CA**	**Total**	
Food Science Quality Control (Vocational)	BSMM-1255	T	Food Chemistry and Nutrition	E	4	4-0-0	5	60	-	20	100	3
		P	PRACTICAL– Food Chemistry and Nutrition		2	0-0-1		-	20			3

Bachelor of Science

(Medical)

(SEMESTER–I)

(Session 2023-24)

Course Code: BSMM-1255

Course Title: Food Science and Quality Control (Vocational) (FOOD CHEMISTRY AND NUTRITION)
(THEORY)

Course Outcomes: After passing this course the student will be able to:

CO1: Understand food, its functions, food groups, food metabolism, nutrition, malnutrition and nutrient requirement for adult men and women as per ICMR.

CO2: Understand the chemistry underlying the properties of various food components.

CO3: Understand the composition and nutritional significance of cereals, milk and milk products.

CO4: Understand the composition and nutritional significance of egg and poultry, meat and fish, fruits and vegetables.

Bachelor of Science
(Medical)

(SEMESTER–I)

(Session 2023-24)

Course Code: BSMM-1255

Course Title: Food Science and Quality Control (Vocational) (FOOD CHEMISTRY AND NUTRITION)
(THEORY)

Examination Time: 3 Hours

Credits: 4-0-0
Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT– I

1. **Introduction to nutrition**–food as a source of nutrients, function of foods, definition of nutrition, nutrients, adequate, optimum and good nutrition, malnutrition.
2. **Inter–relationship between nutrition and health**–parameters of good health.
3. **Food guide**–basic five food groups – Importance, uses.
4. **Food metabolism**–digestion, absorption, transport, utilization of nutrients in the body.
5. **Recommended dietary requirements**- Nutrient requirement for adult men and women as per ICMR.
6. **Water**–function, sources, requirement, water balance, effect of deficiency on health.

UNIT-II

7. **Carbohydrate**—composition, classification, food sources, storage in body, reaction, structure, functions of monosaccharides, oligosaccharides and polysaccharides in foods.

8. **Fat and oils**—composition, saturated, unsaturated fatty acids, food sources, functions of fats. Nomenclature and classification, emulsions and emulsifiers, role of fat and oil in food processing.
9. **Proteins**- composition, essential and non–essential amino acids, sources of protein, functions, protein deficiency diseases, physico–chemical properties, modification of food protein during processing and storage.
10. **Energy**- unit of energy, food as a source of energy, calorific value of food, need for energy, basic metabolic role, utilization of fat, energy requirement.
11. **Minerals**- function, sources, bio–availability and deficiency of macro and micro minerals.
12. **Vitamins**- classification, sources, functions and deficiency diseases of fat and water soluble vitamins.

UNIT– III

13. **Cereals**: Composition and Nutritional aspects, breakfast cereals and cereal products: Bread and pasta.

14. **Milk and Milk Products**: Composition, classification, storage, uses, and nutritional significance of milk, curd, butter, paneer, khoa, cheese, ice–cream and various kinds of processed milk.

UNIT -IV

15. **Egg and Poultry**: Composition and nutrition significance.

16. **Meat and Fish**: Structure, composition and nutritional significance, post mortem changes, changes in meat during cooking.

17. **Fruits and Vegetables**: Nutritive value of fruit and vegetables and their products- jam, jelly, marmalade and canned products.

Books Recommended:

1. Food Chemistry, 2007, 4th Edition, Owen R. Fennema**. (Online available)** **https://edisciplinas.usp.br/pluginfile.php/4937824/mod_folder/content/0/Fennema%E2%80%99s%20Food%20Chemistry-CRC%20Press%20%282008%29%20-%204th%20Edition.pdf?forcedownload=1**

2. Food Chemistry, 2003, 2nd Edition, Connie M. Weaver, James R. Daniel.

3. Food Chemistry, 1974, 3rd Edition, Mian Hoagland Meyer.

4. Principles of Food Chemistry, 2018, 4th Edition, deMan.

5. Basic Food Chemistry, 2012, 4th Edition, Frank A. Lee.

6. Fundamentals of Foods and Nutritions, 2018, 6thEdition, Mudambi S.R., M.V. Rajgopal.

7. Advanced text book of Foods Nutrition, 1985, 2nd Edition, Swaminathan S.

8. Dairy technology: principles of milk properties and processes, 1995, 1st Edition, P. Walstra, T.J Guerts, A. Noomen, A. Jellema and M.A.J.S Van Boekel.

9. Cereal processing technology, 2001, 1st Edition, Gavin Owens.

10. Preservation of Fruit and Vegetables, GirdhariLal, G.S. Siddappaa and G.L. Tandon, ICAR, New Delhi.

11. Analysis and Quality Control for Fruit and VegetableProducts, S Ranganna, McGraw Hill Education (India) Private Limited, Chennai, India.

12. Essentials of Food Science, 2013, 4th Edition, Vickie A. Vaclavik, Elizabeth W. Christian. **(Online available)** **https://core.ac.uk/download/pdf/326762601.pdf**

13. Food Chemistry, 2009, 4th Edition, H.-D. Belitz, W. Grosch, P. Schieberle. **(Online available)** **https://edisciplinas.usp.br/pluginfile.php/4937824/mod_folder/content/0/Hans-Dieter%20Belitz%2C%20Werner%20Grosch%2C%20Peter%20Schieberle%20auth.%20Food%20Chemistry.pdf?forcedownload=1**

Bachelor of Science
(Medical)

(SEMESTER–I)

(Session 2023-24)

Course Code: BSMM-1255

Course Title: Food Science and Quality Control (Vocational) (FOOD CHEMISTRY AND NUTRITION)
(PRACTICAL)

Time: 3 hours **Credits: 0-0-1**

Max. Marks: 20

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

List of Practicals

1. Determination of moisture content of wheat flour.
2. Calculation of BMI and BMR
3. Determination of ash content of food sample.
4. Qualitative tests of proteins and lipids in different foods.
5. Estimation of Vitamin C.
6. Determination of salt content in food products.
7. Estimation of volatile and nonvolatile acids in vinegar.
8. Estimation of fat in food sample by Soxhlet apparatus.
9. Grading and quality evaluation of eggs.
10. Dehydration of common fruits and vegetables.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-II

(SESSION 2023-24)

Bachelor of Sciences (Medical) Semester-II												
Course Name	**Course code**		**Paper**	**Course Type**	**Hours Per Week**	**Credits**	**Total Credits**	**Marks**				**Examination time (in hours)**
								Ext.				
						L-T-P		**L**	**P**	**CA**	**Total**	
Food Science Quality Control (Vocational)	BSMM-2255	T	Food Plant Hygiene and Sanitation	E	4	4-0-0	5	60	-	20	100	3
		P	PRACTICAL– Food Plant Hygiene and Sanitation		2	0-0-1		-	20			3

Bachelor of Science

Medical

(Session 2023-24)

SEMESTER–II

Course Code: BSMM-2255

Course Title: Food Science and Quality Control (Vocational) (FOOD PLANT HYGIENE & SANITATION)

(THEORY)

Course Outcomes: After passing this course the student will be able to:

CO1: Understand hygiene, sanitation and importance of personal hygiene of food handler in food industries.

CO2: Learn different methods of cleaning and sanitation in food processing industries.

CO3: Understand basic principles and practices of cleaning and sanitation in different food processing industries.

CO4: Understand pest control, hygiene of water used for processing and waste product handling in food industries.

Bachelor of Science
(Medical)
(SEMESTER–II)
(Session 2023-24)
Course Code: BSMM-2255
Course Title: Food Science and Quality control (Vocational) (FOOD PLANT HYGIENE & SANITATION)
(THEORY)

Examination Time: 3 Hours

Credits: 4-0-0
Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks(12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT - I

1. Importance of personal hygiene of food handler- habits, clothes, illness, education of handler in handling and service.

2. Cleaning agents and disinfectants. Uses of different cleaning and sanitizing agents.

3. Good Laboratory Practices (GLP) and Good Hygienic Practices (GHP)

4. Cleaning In Place (CIP) and Cleaning Out of Place (COP)

UNIT - II

5. Cleaning methods– sterilization, disinfection, heat & chemicals, chemical tests for sanitizer strength.

UNIT - III

6. Food sanitation- principles & methods, control and inspection, sanitation in fruits & vegetables industry, cereals industry, dairy industry, meat, egg & poultry units.

UNIT - IV

7. Control of infestation, rodent control, vector control, use of pesticides.

8. Hygiene of water used for processing, Analysis of total plate count and *E.coli*

9. Planning & implementation of training programmes for health personnel.

10. Waste disposal and treatment.

Books Recommended:

1. Principles of Food Sanitation by Norman G. Marriott **(Online Available)**
https://ubblab.weebly.com/uploads/4/7/4/6/47469791/principles_of_food_sanitation,_5th_ed.pdf

2. Food Poisoning and Food Hygiene by Hobbs, B. C. and R. J. Gilbert (Online Available)

3. Quantity food sanitation by Longree K

4. Environmental Sanitation in India by Kawata K

B.Sc. Medical
(Session 2023-24)

SEMESTER–II

Course Code: BSMM-2255

FOOD PLANT HYGIENE & SANITATION

(PRACTICAL)

Time: 3 hours **Credits: 0-0-1**

Max. Marks: 20

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

List of Practicals:

1. Sterilization of equipments used in the laboratory by using heat and chemicals.
2. Determination of B.O.D & C.O.D
3. Determination of sanitary status of plant equipment.
4. Chlorination of water.
5. To study the bacteriology of water.
6. Determination of Total dissolved solids (TDS) of water.
7. Determination of Hardness of water.
8. Determination of alkalinity and acidity of water.
9. Determination of organic matter of water.
10. Determination of chlorides and sulphates in water.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-III

(SESSION 2023-24)

Bachelor of Science (Medical) Semester III								
Course Code	**Course name**	**Course Type**	**Marks**					**Examination time (in Hours)**
			Total	**Paper**	**Ext.**		**CA**	
					L	**P**		
BSMM-3255	Food Science and Quality Control (Vocational) (Food Processing and Packaging)	E	100	Food Processing and Packaging	60	-	20	3
				Practical- Food Processing and Packaging	-	20		3

Bachelor of Science

(Medical)

(SEMESTER–III)

(Session 2023-24)

Course Code: BSMM-3255

Course Title: Food Science and Quality Control (Vocational) (FOOD PROCESSING AND PACKAGING)
(THEORY)

Course Outcomes: After passing this course the student will be able to:

CO1: Learn about the methods of food preservation and processing of fats, oils and sugar.

CO2: Learn about the processing of salt, tea, coffee, chocolate and cocoa powder, extruded foods and role of enzymes in food processing.

CO3: Learn about spices and flavors, food additives and manufacturing of fermented products.

CO4: Understand types of packaging materials, their properties and machinery.

Bachelor of Science

(Medical)

(SEMESTER–III)

(Session 2023-24)

Course Code: BSMM-3255

Course Title: Food Science and Quality Control (Vocational) (FOOD PROCESSING AND PACKAGING)
(THEORY)

Examination Time: 3 Hours

Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

1. Physical principles underlying food processing operations including thermal processing, ionizing radiation, refrigeration, freezing, dehydration.
2. Chemical preservation in food processing.
3. Fats and Oils: Types and sources of fats and oils (animal and vegetable), processing, uses, storage and nutritional aspects.
4. Sugar and Sugar Products: Different forms of sugar (sugar, jaggery, honey syrup), manufacture, selection, storage and use.

UNIT-II

5. Salt: preparation of brine and pickling.
6. Processing of: Tea, coffee, chocolate and cocoa powder.
7. Extruded foods.
8. Enzymes: Definition, factors affecting enzyme activity, role of enzymes in food processing.

UNIT-III

9. Fermentation technology, manufacturing of fermented products: Wine, vinegar, beer, yoghurt, etc.
10. Spices and flavors.
11. Food additives, classes of food additives, role in food processing.

UNIT-IV

12. Definition and functions of Packaging
13. Types of packaging materials: metal, glass, wood, paper and plastics and their importance
14. Types of packages and their evaluation: bottle, pouch, tetra-pack and cans
15. Packaging machinery
16. Shelf life testing

Books Recommended

1. Post Harvest Technology of Cereals, Pulses and Oilseeds, 2019, 3rdEdition, AmalenduChakraverty.
2. Technology of Cereals, 1994, 4th Edition, Norman Leslie Kent and A.D. Evers.
3. Preservation of Fruits & Vegetables, 2009, GirdhariLal, G.S Siddappa and G.L Tandon.
4. Principles of Food Packaging, 1980, 2nd Edition, Stanley Sacharow and Roger C. Griffin.
5. Chemistry of food additives and preservatives, 2012, 1st Edition, Titus A.M. Msagati.
6. Food Preservation, 2nd Edition, M. ShafiurRahman. **(Online available)** http://www.cold.org.gr/library/downloads/Docs/Handbook%20of%20Food%20Preservation.PDF
7. Food Packaging – Principles and practice, 3rd Edition, 2012, Gordon L. Robertson. **(Online available) https://es.1lib.in/book/2353881/49b558?dsource=recommend**

Bachelor of Science
(Medical)

(SEMESTER–III)

(Session 2023-24)

Course Code: BSMM-3255

Course Title: Food Science and Quality Control (Vocational) (FOOD PROCESSING AND PACKAGING)
(PRACTICAL)

Time: 3 hours **Max. Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

List of Practicals:

1. Determination of physical characteristics of cereals.
2. Milling of wheat into flour.
3. Determination of wet and dry gluten contents.
4. Identification of packaging materials.
5. To estimate the shelf life of packaged food.
6. To determine the strength of different packaging material.
7. To find out the tin coating weight.
8. To find out the uniformity and amount of wax on wax paper.
9. To check the chemical resistance of packaging materials.
10. To check the adequecy of blanching.
11. Visit to various industries dealing with food packaging material like, paper board and metal.

KanyaMahaVidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-IV

(Session 2023-24)

Bachelor of Science (Medical) Semester IV								
Course Code	**Course name**	**Course Type**	**Marks**					**Examination time (in Hours)**
			Total	**Paper**	**Ext.**		**CA**	
					L	**P**		
BSMM-4255	Food Science and Quality Control (Vocational) (Quality Assurance)	E	100	Quality Assurance	60	-	20	3
				Practical- Quality Assurance	-	20		3

Bachelor of Science

(Medical)

SEMESTER–IV

(Session 2023-24)

COURSE CODE: BSMM-4255

Course Title: Food Science and Quality Control (Vocational) (QUALITY ASSURANCE)

(THEORY)

Course Outcomes: After passing this course the student will be able to:

CO1: Understand the quality control in food industry and quality attributes.

CO2: Learn about quality assessment methods in different food industries.

CO3: Understand the sampling techniques and sensory evaluation of food.

CO4: Understand the concept of HACCP, GMP and food laws and regulations.

Bachelor of Science
(Medical)
(SEMESTER–IV)
(Session 2023-24)
COURSE CODE: BSMM-4255
Course Title: Food Science and Quality Control (Vocational) (QUALITY ASSURANCE)
(THEORY)

Examination Time: 3 Hrs

Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

1. Objectives, importance and functions of quality control
2. Quality attributes
3. Quality control in food industry-methods of evaluation and control of the various aspects of quality of raw materials, manufacturing process and the testing of finished products.

UNIT-II

4. Methods of quality assessment of food materials: fruits, vegetables, cereals, dairy products, meat, egg and processed products.
5. Color: Definition, importance, different color measuring instruments used in food industries.
6. Texture: Definition, importance, different texture analyzing instruments used in food industries to analyze texture.

UNIT-III

7. Sampling, specifications of raw materials and finished products
8. Sensory evaluation.

UNIT-IV

9. Concept of HACCP and GMP.
10. Food Laws and Regulations- FSSAI, AGMARK, FPO, PFA, MFPO, BIS, ISO.

Recommended Books:

1. Quality Control for Food Industry by A. Kramer and B.A. Twigg

2. Handbook of analysis and quality control for fruits and vegetable products by S. Ranganna

3. Food Science by N.N. Potter (Online Available) https://hostnezt.com/cssfiles/gsa/Food%20Science%205th%20Ed%20By%20Norman%20Potter.pdf

B.Sc. Medical (Session 2023-24)

SEMESTER–IV

COURSE CODE: BSMM-4255

QUALITY ASSURANCE

(PRACTICAL)

Time:3 hrs **Max. Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

List of Practicals:

1. Determination of acidity and pH of milk.
2. Platform tests for determining the quality of milk.
3. Determination of cooking quality of rice.
4. Determination of iodine value of oil/fat.
5. Determination of saponification value of oil/fat.
6. Determination of reducing and non-reducing sugars.
7. Determination of interior and exterior quality of eggs.
8. Determination of alcoholic acidity of flour.
9. Adulterants in milk, cereals, oils and fats and their detection.
10. Cut out analysis of canned fruits and vegetables.

KanyaMahaVidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-V

(SESSION 2023-24)

Bachelor of Science (Medical) Semester V								
Course Code	**Course name**	**Course Type**	**Marks**					**Examination time (in Hours)**
			Total	**Paper**	**Ext.**		**CA**	
					L	**P**		
BSMM-5255	Food Science and Quality Control (Vocational) (Food Analysis)	E	100	Food Analysis	60	-	20	3
				Practical- Food Analysis	-	20		3

Bachelor of Science

(Medical)

(SEMESTER–V)

(Session 2023-24)

Course Code: BSMM-5255

Course Title: Food Science and Quality Control (Vocational) (FOOD ANALYSIS) (THEORY)

Course Outcomes: After passing this course the student will be able to:

CO1: Understand the food composition and proximate analysis of food components.

CO2: Learn the analysis of micronutrients.

CO3: Understand the physical methods of food analysis including food rheology, refractometry and polarimetry.

CO4: Learn different chromatography techniques.

Bachelor of Science

(Medical)

(SEMESTER–V)

(Session 2023-24)

Course Code: BSMM-5255

Course Title: Food Science and Quality Control (Vocational) (FOOD ANALYSIS) (THEORY)

Examination Time: 3 Hours

Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

1. Food composition and factors effecting food composition.

2. Proximate composition analysis of food.

UNIT-II

3. Analysis of Micronutrients and minerals.

UNIT-III

4. General physical methods of analysis of foods: Refractometry & Polarimetry.

5. Introduction and principles of Food rheology, types of viscosity, equipments used to check the viscosity.

UNIT-IV

6. Basic principles and working of Column chromatography, Gas chromatography and High Pressure Liquid Chromatography.

Reference Books:

1. Manuals of Food Quality Control additions contaminants techniques, 1980.

2. The Chemical Analysis of Food and Food Products by Morries B Jacob, 3rd Edition., Roberte, Krieger.

3. Food Analysis, 2019, 4th Edition, S. Suzanne Nielsen. **(Online available)** **http://154.68.126.6/library/Food%20Science%20books/batch1/Food%20Analysis%20Fourth%20Edition.pdf**

4. Analysis and Quality Control for Fruit and Vegetable Products, S Ranganna, McGraw Hill Education (India) Private Limited, Chennai, India.

Bachelor of Science

(Medical)

(SEMESTER–V)

(Session 2023-24)

Course Code: BSMM-5255

Course Title: Food Science and Quality Control (Vocational) (FOOD ANALYSIS) (PRACTICAL)

Time: 3 hrs **Max. Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by theInternal and External Examiners. Two copies of the same may be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

List of Practicals:

1. Determination of milk quality by lactometer.
2. To find out the TSS of food sample by refractometer.
3. Determination of surface tension of food sample by using drop number method.
4. Determination of viscosity index of food sample.
5. Proximate composition of different types of food.
6. Estimation of different minerals in food.
7. Estimation of vitamins in food.
8. Determination of dry and wet gluten content in wheat flour.
9. Determination of Chlorophyll content in food sample.
10. Estimation of percent loss in weight after drying and dehydration.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-VI

(SESSION 2023-24)

Bachelor of Science (Medical) Semester VI								
Course Code	**Course name**	**Course Type**	**Marks**					**Examination time (in Hours)**
			Total	**Paper**	**Ext.**		**CA**	
					L	**P**		
BSMM-6255	Food Science and Quality Control (Vocational) (Food plant layout and management)	E	100	Food plant layout and management	60	-	20	3
				Practical- Food plant layout and management	-	20		3

Bachelor of Science

(Medical)

SEMESTER–VI

(Session 2023-24)

COURSE CODE: BSMM-6255

Course Title: Food Science and Quality Control (Vocational) (Food Plant layout and management)

(THEORY)

Course Outcomes: After passing this course the student will be able to:

CO1: Understand the importance of plant layout and learn how to set up the proper plant layout to reduce the production cost and increase the productivity.

CO2: Learn how market research helps to understand the consumers, their needs and their satisfaction level.

CO3: Understand the societal changes and their impact on food consumption trends.

CO4: Learn about product development and different types of food products.

Bachelor of Science
(Medical)
(SEMESTER–VI)
(Session 2023-24)
Course Code: BSMM-6255
Course Title: Food Science and Quality Control (Vocational) (FOOD PLANT LAYOUT & MANAGEMENT)
(THEORY)

Examination Time: 3 Hrs.

Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

1. Importance of a plant layout, selection of site and layouts of different food industries.

2. Selection of equipments, machinery and building material, selection and planning of manufacturing process and service facilities

3. Maintenance and replacement, Depreciation of machinery, Management set up in a plant.

UNIT-II

4. Market and Consumer Research
5. Economic, Psychological, Anthropological and Sociological dimensions of food consumption pattern. Food situation in India and outside.

UNIT-III

6. Needs and types of Food consumption trends. Trends in social change and its role in diet pattern using social trends as a framework in new product innovation.
7. Trapping the unconventional post-harvest losses and prospects of food processing for export.

UNIT –IV

8. Traditional foods-Status and need for revival in the context of westernized non-traditional foods, urbanization and such factors.
9. Product development: Primary Processing, Secondary Processing, Types of products e.g. Quick cooking, fast foods, fabricated food, convenience foods.

Recommended Books:

1. Principle of Food Sanitation by Marriott, 5th ed., 2006, CBS Publishers, New Delhi.
2. Food Processing Waste Management by Green JH and Kramer A, 1979, AVI Publishers, USA.
3. Food Science by Potter NN, 5th ed., 2006, CBS Publishers, New Delhi.

B.Sc. Medical

(Session 2023-24)

SEMESTER–VI

COURSE CODE: BSMM-6255

FOOD PLANT LAYOUT AND MANAGEMENT

(PRACTICAL)

Time: 3 hrs **Max. Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

List of Practicals:

1. Calculation of depreciation and processing costs.
2. Preparation of layout and Process diagram of potato chips manufacturing plant.
3. Preparation of layout and Process diagram of jam/marmalade manufacturing plant.
4. Preparation of layout and Process diagram of bread making plant.
5. Preparation of layout and Process diagram of dairy industry.
6. Preparation of layout and Process diagram of wine making unit.
7. Preparation of layout and Process diagram of modern slaughter plant.
8. Preparation of layout and Process diagram of confectionary unit.
9. Determination of sanitary status of plant equipment.
10. Visit to various food industries.

FACULTY OF SCIENCES

Syllabus

Of

Microbiology

For

B.Sc. Medical (Semester I - II)

(Under Credit Based Continuous Evaluation Grading System)

B.Sc. Medical (Semester III - VI)

(Under Continuous Evaluation System)

(12+3 System of Education)

Session: 2023-24

The Heritage Institution

KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)

KanyaMahaVidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-I

(SESSION 2023-24)

Bachelor of Sciences (Medical) Semester-I												
Course Name	**Course code**		**Paper**	**Course Type**	**Hours Per Week**	**Credits**	**Total Credits**	**Marks**				**Examination time (in hours)**
								Ext.				
						L-T-P		**L**	**P**	**CA**	**Total**	
Microbiology	BSMM-1343	T	Fundamentals of Microbiology	E	4	4-0-0	5	60	-	20	100	3
		P	PRACTICAL– Fundamentals of Microbiology		2	0-0-1		-	20			3

Bachelor of Science

(Medical)

(SEMESTER–I)

(Session 2023-24)

Course Code: BSMM-1343

Course Title: FUNDAMENTALS OF MICROBIOLOGY (THEORY)

Course Outcomes:

After passing this course the student will be able to:

CO1: Learn about history of microbiology and characterization and identification of microorganisms.

CO2: Understand the principle and applications of different microscopes and methods of sterilization, pure culture concept and different staining methods of bacteria.

CO3: Understand the structure of bacterial cell and nutritional requirement of microorganisms, different types of media and control of microorganisms by physical and chemical agents.

CO4: Understand the reproduction and growth of microorganisms and common bacterial and viral diseases in human.

Bachelor of Science

(Medical)

(SEMESTER–I)

(Session 2023-24)

Course Code: BSMM-1343

Course Title: FUNDAMENTALS OF MICROBIOLOGY (THEORY)

Examination Time: 3 Hours

Credits: 4-0-0
Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

Introduction and Scope of Microbiology: Discovery of microorganisms, history of microbiology, controversy over spontaneous origin or microorganisms, discovery of anaerobic life, germ theory of fermentation as life without oxygen, germ theory of disease.

Characterization and Identification of Microorganisms: Place of microorganisms inliving world, Hackel's and Whittaker's system of classification, prokaryotic and eukaryotic cells, characteristics of main groups of microorganisms.

UNIT–II

Microscopy: Principles and applications of Bright field microscopy, Dark field phase contrast, Fluorescence and Immuno-fluorescence, Electron microscopy.

Methods in Microbiology: Methods of sterilization, preparation of a culture media, pure culture concept, staining of bacteria such as simple, negative and differential methods. Antibiotics, properties and mode of action: drug resistance and its significance, antibiotic sensitivity test.

UNIT–III

Structure of Bacteria: Fine structure of bacterial cell, cell wall, cell membrane, capsule, pili, flagella, ribosomes, Cytoplasmic inclusions, Bacterial movement, Endospore and physiology of endospore formation.

Nutrition: Nutritional requirements of microorganisms, nutritional types of bacteria, autotrophs, heterotrophs, parasites, types of culture media, differential media, selective media and enrichment media. Control of microorganisms by physical and chemical agents.

UNIT–IV

Reproduction and Growth in Microorganisms: Modes of cell division, growth curve of bacteria, continuous culture, synchronous growth, quantitative measurement of bacterial growth, Effect of various factors on growth of bacteria.

Clinical Microbiology: Epidemiology reservoirs and modes of transmission of infectious diseases. Pathogenesis, diagnosis and treatment of common bacterial and viral diseases (including COVID 19) in humans.

Books Recommended:

1. Pelczar, M.I., Chan, E.C.S. and Krieg, N.R. 2011, 5th edition, Microbiology. Tata McGraw Hill Publishing Co., Ltd.,New Delhi.
2. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 2005, 5th edition, General Microbiology, MacMillan Education Ltd. Publisher.
3. Powar, C.B. and Dagniwala, H.F. 2012, General Microbiology, Volume I and II, Himalaya Publishing House, Delhi.
4. Sharma, P.D. 2010, Microbiology, Rastogi Publications, Meerut. 142.
5. Clinical microbiology by UsmanWaheed, Asim Ansari, Anwar Ullah and Ihsan Ali., 1st Edition, 2013. **(Online available)**
6. General Microbiology by Linda Bruslind, 1st Edition. **(Online available)**
7. General Microbiology by H.G. Schlegel, 6th Edition. **(Online available)**

Bachelor of Science

(Medical)

(SEMESTER–I)

(Session 2023-24)

Course Code: BSMM-1343

Course Title: FUNDAMENTALS OF MICROBIOLOGY (PRACTICAL)

Time: 3 hrs **Credits: 0-0-1**
Marks: 20

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya MahaVidyalaya, Jalandhar.

LIST OF PRACTICALS

1. To study the essentials of a microbiology laboratory.

2. To study various parts of a laboratory microscope.

3. To study various sterilization techniques.

4. To prepare the culture media for the cultivation of various microorganisms.

5. To study various laboratory techniques for the isolation and cultivation of pure cultures of microorganisms.

6. To perform the simple staining of bacterial cell.

7. To perform the differential staining of bacterial cell.

8. To study the typical growth curve of bacteria.

9. To measure the size of microbial cells by ocular micrometery.

KanyaMahaVidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-II

(SESSION 2023-24)

Bachelor of Sciences (Medical) Semester-II												
Course Name	**Course code**		**Paper**	**Course Type**	**Hours Per Week**	**Credits**	**Total Credits**	**Marks**				**Examination time (in hours)**
								Ext.				
						L-T-P		**L**	**P**	**CA**	**Total**	
Microbiology	BSMM-2343	T	Basic Food Microbiology	E	4	4-0-0	5	60	-	20	100	3
		P	PRACTICAL– Basic Food Microbiology		2	0-0-1		-	20			3

B.Sc. Medical (Session 2023-24)

SEMESTER–II

Course Code: BSMM-2343

Course Title: BASIC FOOD MICROBIOLOGY

(THEORY)

Course Outcomes:

After passing this course the student will be able to:

CO1: Learn about microorganisms important in food microbiology and the intrinsic and extrinsic factors affecting their growth.

CO2: Learn about the origin and preparation of fermented foods.

CO3: Understand the methods of food preservation and applications of prebiotics and probiotics.

CO4: Understand the spoilage in different food products.

Bachelor of Science

(Medical)

(SEMESTER–II)

(Session 2023-24)

Course Code: BSMM-2343

Course Title: BASIC FOOD MICROBIOLOGY

(THEORY)

Time: 3 Hrs.

Credits: 4-0-0
Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

Food as a substrate for microorganisms, intrinsic and extrinsic factors affecting the growth of various microorganisms in foods. Microorganisms important in food microbiology–bacteria, yeasts and molds, sources of contamination in foods.

UNIT–II

Fermented foods, origin of fermentation as a method of preparing indigenous foods, bread, dosa, idli, warri, tempeh, miso

UNIT–III

Principles of food preservation and spoilage, asepsis, anaerobic conditions, aseptic packaging, preservation methods, high temperature, low temperature, drying, chemical preservatives. Applications of prebiotics and probiotics.

UNIT–IV

Spoilage of various milk and milk products, cereal and cereal products, vegetable and fruits, meat and meat products, canned foods. Food poisoning and food infection. *Staphylococcal*, *Clostridium* and *Salmonella* intoxications.

Books Recommended:

1. Frazier. W.C. and Westhoff, D.C. 2006, 26th edition, Food Microbiology, Tata McGraw Hill Publishing Co., Ltd., New Delhi.

2. Banwart, G.J., 2012, Basic Food Microbiology, Springer Verlag, New Delhi.

3. Powar, C.B. and Dagniwala, H.F. 2012, General Microbiology Volume II. Himalaya Publishing House, New Delhi. 128

B.Sc. Medical

(Session 2023-24)

SEMESTER–II

Course Code: BSMM-2343

Course Title: BASIC FOOD MICROBIOLOGY

(PRACTICAL)

Time: 3 hrs **Credits: 0-0-1**
Marks: 20

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

LIST OF PRACTICALS

1. To enumerate the total microbial cells in a suspension by serial dilution and pour plating.
2. To enumerate the total bacteria in milk by direct microscopic count.
3. To study the morphology of bacteria, yeasts and molds.
4. To check the bacteriological quality of raw milk by methylene blue reduction test.
5. Baking of bread and making of dhokla and idli.
6. To study the spoilage causing microorganisms present in spoiled bread and raw milk.

KanyaMahaVidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-III
(SESSION 2023-24)

Bachelor of Science (Medical) Semester III								
Course Code	**Course name**	**Course Type**	**Marks**					**Examination time (in Hours)**
			Total	**Paper**	**Ext.**		**CA**	
					L	**P**		
BSMM-3343	Microbiology	E	100	Microbial Nutrition and Metabolism	60	-	20	3
				Practical-Microbial Nutrition and Metabolism	-	20		3

Bachelor of Science

(Medical)

(SEMESTER–III)

(Session 2023-24)

Course Code: BSMM-3343

Course Title: MICROBIAL NUTRITION AND METABOLISM

(THEORY)

Course Outcomes:

After passing this course the student will be able to:

CO1: Understand the nutritional requirements for growth of microorganisms and types of microorganisms on the basis of nutrition.

CO2: Understand the transport of nutrients across the cell membrane.

CO3: Learn about the metabolic pathways and electron transport chain of bacteria.

CO4: Learn about the enzyme kinetics and biosynthesis of nucleic acids.

Bachelor of Science

(Medical)

(SEMESTER–III)

(Session 2023-24)

Course Code: BSMM-3343

Course Title: MICROBIAL NUTRITION AND METABOLISM

(THEORY)

Examination Time: 3 Hours

Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

Nutrition, requirements for growth of microorganisms, nutrients and accessory constituents, medium designing. Nutritional types of microorganisms (photolithotrophs, photoorganotrophs, chemolithotrophs and chemoorganotrophs)

UNIT–II

Transport of nutrients across the cell membrane, diffusion, passive transport, active transport, and group translocation for the transport of nutrients across the membrane.

UNIT–III

Bioenergetics; Laws of thermodynamics, entropy, enthalpy and free energy of reaction standard, oxidative phosphorylation, electron transport, respiratory chains of bacteria, energy metabolism in aerobic and anaerobic microorganisms, pathways for breakdown of glucose (glycolysis, Kreb's cycle fermentation, pentose phosphate pathways), gluconeogenesis, metabolism of starch & cellulose by bacteria.

UNIT–IV

Assimilation of nitrogen, biosynthesis of nucleic acids, for synthesis of purine and pyrimidine nucleotides. Enzymes, kinetics, Michaelis Menten equation and allosteric enzymes.

Books Recommended:

1.Pelczar, M.I., Chan, E.C.S. and Krieg, N.R. 2011, 5th edition, Microbiology. Tata McGraw Hill Publishing Co., Ltd., New Delhi.

2.Stanier, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 2005, 5th edition, General Microbiology, MacMillan Education Ltd. Publisher.

3.Powar, C.B. and Dagniwala, H.F. 2012, General Microbiology, Volume I and II, Himalaya Publishing House, Delhi.

4.Sharma, P.D. 2010, Microbiology, Rastogi Publications, Meerut. 142.

5.Bacterial physiology and metabolism by Byung Hong Kim and Geoffrey Michael Gadd. **(Online available)**

Bachelor of Science

(Medical)

(SEMESTER–III)

(Session 2023-24)

Course Code: BSMM-3343

Course Title: MICROBIAL NUTRITION AND METABOLISM (PRACTICAL)

Time: 3 hrs **Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya MahaVidyalaya, Jalandhar.

LIST OF PRACTICALS

1. Isolation and enumeration of total bacteria from soil by pour plating and spread plating.
2. Comparison of growth on complex medium and defined or minimal medium.
3. Distinction between fermenting and non-fermenting microorganisms.
4. Effects of various concentrations of carbon source on bacterial growth.
5. Effects of various concentrations of nitrogen source on bacterial growth.
6. Effect of temperature on bacterial growth.
7. Effect of pH on bacterial growth.
8. Effect of salt on bacterial growth.
9. Effect of metals on bacterial growth.
10. Effect of dye on bacterial growth.

KanyaMahaVidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-IV

(Session 2023-24)

Bachelor of Science (Medical) Semester IV								
Course Code	**Course name**	**Course Type**	**Marks**					**Examination time (in Hours)**
			Total	**Paper**	**Ext.**		**CA**	
					L	**P**		
BSMM-4343	Microbiology (Microbial Ecology)	E	100	Microbial Ecology	60	-	20	3
				Practical-Microbial Ecology	-	20		3

B.Sc. Medical

(Session 2023-24)

SEMESTER–IV

Course Code: BSMM-4343

Course Title: MICROBIAL ECOLOGY

(THEORY)

Course Outcomes:

After passing this course the student will be able to:

CO1: Understand the Diversity of various microbial habitats.

CO2: Understand the various microbial interactions and competition for survival in nature.

CO3: Understand the role of microorganisms in geochemical cycles, concept of microbial toxins, biofertilizers and bioinsecticides.

CO4: Understand the effluent treatment, bioremediation and bioleaching.

B.Sc. Medical

(Session 2023-24)

SEMESTER–IV

Course Code: BSMM-4343

Course Title: MICROBIAL ECOLOGY

(THEORY)

Time: 3 Hrs. **Max Marks: 100**

Theory Marks: 60

Practical Marks: 20

CA: 20

Instructions for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

Diversity of microbial habitats: Environmental selecting factors: - physical, chemical and biological types of microbial habitats: - atmospheric, aquatic and terrestrial environments.

UNIT–II

Microbial interactions, antagonism, commensalism, symbiosis, parasitism miscellaneous associations in nature. Competition for survival in nature (for nutrients, space, oxygen).

UNIT–III

Role of microorganisms in geochemical cycles: Carbon cycle, nitrogen cycle, phosphorus cycle and sulphur cycle, microbial toxins in the environment: Types of Microbial toxins, ecological consequences of microbial toxins as insecticidal agents, bioinsecticides, biofertilizers.

UNIT–IV

Concept of BOD and COD, Sewage and effluent treatment by primary, secondary and tertiary methods. Role of microbes in bioremediation of persistent pollutants and bioleaching of metals.

Books Recommended: (Edition of books updated)

1. Edmonds, P., 1978, Microbiology: An Environmental Perspective, MacMillan Publishing Co., Inc., New York.
2. Powar C.B. and Danginwala, H.F., 2017, General Microbiology, Volume II, 2nd ed. Himalaya Publishing House, New Delhi.
3. Sharma, P.D., 2010, Microbiology, Rastogi Publication, Meerut.
4. Pleczar, M.J., Chan, E.C.S. and Krieg N.R., 2011 (reprint), Microbiology, 2nd ed. Tata McGraw Hill Publishing Co., Ltd., New Delhi.
5. Patel, A.H., 2011, Industrial Microbiology, 2nded. Macmillan India Ltd., Delhi.

B.Sc. Medical

(Session 2023-24)

SEMESTER–IV

Course Code: BSMM-4343

Course Title: MICROBIAL ECOLOGY

(PRACTICAL)

Time: 3 hrs **Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya MahaVidyalaya, Jalandhar.

LIST OF PRACTICALS

1. Isolation and enumeration of fungi from air and soil by pour plating and spread plating.
2. Determination of dissolved oxygen content (DO) of the given water sample by Titrimetric method.
3. Determination of COD of the given water sample by Titrimetric method.
4. To conduct bacteriological examination of water sample by MPN method.
5. To isolate symbiotic nitrogen bacteria from root nodules.
6. To perform crowded plate method for studying microbial interactions.
7. Determination of B.O.D.
8. Lethal effect of Ultra violet light on bacterial growth.

KanyaMahaVidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-V (SESSION 2023-24)

Bachelor of Science (Medical) Semester V								
Course Code	**Course name**	**Course Type**	**Marks**					**Examination time (in Hours)**
			Total	**Paper**	**Ext.**		**CA**	
					L	**P**		
BSMM-5343	Microbiology	E	100	Applied Microbiology - I	60	-	20	3
				Practical- Applied Microbiology - I	-	20		3

Bachelor of Science

(Medical)

(SEMESTER–V)

(Session 2023-24)

Course Code: BSMM-5343

Course Title: APPLIED MICROBIOLOGY-I
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

CO1: Understand the history and scope of industrial microbiology and preservation of stock cultures.

CO2: Understand the screening of microorganisms and composition and characteristics of fermentation media.

CO3: Learn about the fermenter and types of industrial fermentation.

CO4: Understand the downstream processing, fermentation economics and patent.

Bachelor of Science

(Medical)

(SEMESTER–V)

(Session 2023-24)

Course Code: BSMM-5343

Course Title: APPLIED MICROBIOLOGY-I
(THEORY)

Examination Time: 3 Hours

Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT- I

Microorganisms in Industry: Historical development, definition and scope of industrial microbiology; contribution of Louis Pasteur in fermentation; sources of industrial microorganisms and their essential characteristics, natural habitats, cultural collections and preservation of stock cultures.

UNIT- II

Screening of Microorganisms: Isolation of industrially important microorganisms, primary and secondary screening methods for isolating useful Yeast, Bacteria and Fungi. Fermentation media, composition of production media, characteristics of an ideal production medium, raw materials.

UNIT- III

Fermentation and Fermentation processes: Fermentation as biological activity, Types of industrial fermentations (submerged, solid state and continuous fermentation). Design of fermenter (body construction, aeration, agitation and control of septic conditions), Basics of batch culture, fedbatch culture and continuous culture.

UNIT- IV

Downstream Processing: Recovery and Purification of Fermentation Products; General principles of separation of fermentation products, solid particles, foam separation, separation by filtration, centrifugation, cell disruption, liquid - liquid chromatography, ion exchange chromatography. Fermentation economics; planning, fermentation designing, process designing, market potential and recovery costs for the industrial set up.

Patent: Introduction, composition, subject matter, characteristics, protection of rights of inventor, cost).

Books Recommended:

1. Casida, L.E. 2016, 2nd Edition.*Industrial Microbiology*. Wiley Eastern Ltd., New Delhi.

2. Stanbury, P.F. Whittaker, A. and Hall S.J. 2016, 3rd Edition. Principles of Fermentation Technology. Elsevier Science Ltd., U.K.

3. Patel, A.H. 2011, 2nd Edition. *Industrial Microbiology*, Macmillan India Ltd., Delhi.

4. Trevan M.D., Saffey, S., Goulding, K.H. and Stanberry, P. 2007. *Biotechnology: The Biological Principles,* Tata McGraw Hill Publishing Co. Ltd., New Delhi.

5. Freifelder, D. 2006, 2nd Edition. Microbial Genetics. Jones and Barttett Publishers Inc., Boston.

6. Applied Microbiology by Corinne Whitby and Torben Lund Skovhus. **(Online available)**

7. Applied Microbiology by Perlman. **(Online available)**

Bachelor of Science

(Medical)

(SEMESTER-V)

(Session 2023-24)

Course Code: BSMM-5343

Course Title: APPLIED MICROBIOLOGY-I (PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

List of Practicals:

1. Isolation of microorganisms from (a) soil (b) fruits.
2. Screening of industrially important Amylase producing microorganisms.
3. Screening of industrially important Protease producing microorganisms
4. Protein estimation by Lowry method.
5. Preservation of industrially important microorganisms by various methods
   (a) Storage in 10% glycerol
   (b) Storage in mineral oil.
6. Determination of % viability of yeast cells by haemocytometer.

KanyaMahaVidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical) Semester-VI

(Session 2023-24)

Bachelor of Science (Medical) Semester VI								
Course Code	**Course name**	**Course Type**	**Marks**					**Examination time (in Hours)**
			Total	**Paper**	**Ext.**		**CA**	
					L	**P**		
BSMM-6343	Microbiology (Applied Microbiology-II)	E	100	Applied Microbiology-II	60	-	20	3
				Practical- Applied Microbiology-II	-	20		3

B.Sc. Medical

(Session 2023-24)

SEMESTER–VI

Course Code: BSMM-6343

Course Title: APPLIED MICROBIOLOGY-II

(THEORY)

Course Outcomes:

After passing this course the student will be able to:

CO1: Understand the processing of fermented foods.

CO2: Understand the Microbial Cell as Fermentation Products and production of different industrial chemicals.

CO3: Understand the role of microorganisms in preparation of alcoholic beverages and industrial enzymes.

CO4: Understand the role of microorganisms in the production of vitamins, amino acids and antibiotics.

B.Sc. Medical

(Session 2023-24)

SEMESTER–VI

Course Code: BSMM-6343

Course Title: APPLIED MICROBIOLOGY-II

(THEORY)

Time: 3 Hrs. **Max Marks:100**
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Fermentation Process of Fermented Foods: Fermented cereal, legume and milk products. Microbiology of natural fermentation. Sauerkraut, Yoghurt, Soya sauce, Cheese.

UNIT-II

Microbial Cell as Fermentation Products: Baker's and brewer's yeast, single cell protein, mushroom farming. Production of industrial chemicals: Acetic acid, Citric acid, Acetone and Butanol.

UNIT-III

Production of alcoholic Beverages: Beer, wine and distilled beverages – Whisky, Brandy, Vodka, Gin production and applications of industrial enzymes: Amylases, Proteases, immobilization of enzymes.

UNIT-IV

Vitamins and Amino acids production by Microorganisms: Riboflavin (B2) and Cyanocobalamin (B12), Glutamic acid. Production of antibiotics: Penicillin and Streptomycin.

Books Recommended:

1. Read, G. 1982. Prescott and Dunn, *Industrial Microbiology*.CBS Publishers & Distributers, New Delhi.

2. Casida, L.E. 1991. *Industrial Microbiology*. Wiley Eastern Ltd., New Delhi.

3. Patel, A.H. 1984. *Industrial Microbiology*. Macmillan India Ltd., Delhi.

4. Trevan, M.D. Saffey, S., Goulding, K.H. and Stanberry, P. 1988. *Biotechnology: The Biological Principles*, Tata McGraw Hill Publishing Co. Ltd., New Delhi

5. Wiseman, A. 1995. *Handbook of Enzyme Biotechnology*. Ellis Harwood Ltd., London.

6. Wood, J.B.B., 1998. *Microbiology of Fermented Foods*, Volumes 1 and 2, Blackie Academic and Professional, London.

7. Power C.B. and Dagniwala, H.F.1992. *General Microbiology*. Volume-2. Himalaya Publishing House, New Delhi.

B.Sc. Medical

(Session 2023-24)

SEMESTER–VI

Course Code: BSMM-6343

Course Title: APPLIED MICROBIOLOGY-II

(PRACTICAL)

Time: 3 hrs **Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya MahaVidyalaya, Jalandhar.

LIST OF PRACTICALS

1. Production of amylases and proteases in liquid medium using the selected organisms.
2. Assay of crude enzyme preparation for Amylase.
3. Assay of crude enzyme preparation for Protease.
4. Production of alcohol from molasses and cereal grains.
5. Immobilization of microbial cells and enzyme preparations by calcium alginate entrapment method.
6. Comparison of submerged and solid state fermentation techniques for amylase production.
7. To study the production of wine and vinegar.
8. To study the kinetics of growth of yeast in batch/continuous culture.