

## UG MICROBIOLOGY

### USMBA20 – SKILL BASED ELECTIVE: MUSHROOM TECHNOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: III	USMBA20	Mushroom Technology	Theory	Skill Based Elective	2	2	100

**Course Objective:** The course will provide adequate hands on experience in handling and cultivation of edible mushrooms. The subject content is designed to develop an entrepreneur.

#### Course Outcomes (CO):

At the end of the course, the learners will be able to;

**CO1:** Communicate information about scope and importance of mushrooms.

**CO2:** Formulate media used for cultivation of mushroom and select the appropriate methods for spawn production.

**CO3:** Demonstrate mushroom cultivation technology and its preservation

**CO4:** Compile in detail about edible and poisonous mushrooms.

**CO5:** Utilize the nutritional and medicinal values of mushrooms.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	H	M	M	H
CO2	H	M	H	H	M	H
CO3	H	H	H	H	L	H
CO4	H	M	M	M	L	H
CO5	H	M	H	M	M	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	M	M	H
CO2	H	M	H	H	M	H
CO3	H	H	H	H	L	H
CO4	H	M	M	M	L	H
CO5	H	M	H	M	M	H

**H – HIGH (3)**

**M – MODERATE (2)**

**L – LOW (1)**

## **COURSE SYLLABUS**

### **UNIT I: History and scope of mushroom cultivation. (6 hours)**

- 1.1 Introduction to mushroom cultivation. (K1,K2)
- 1.2 History to mushroom cultivation. (K1,K2)
- 1.3 Scope and importance of mushroom cultivation. (K1,K2)
- 1.4 Present status of mushroom industry in India. (K1,K2)
- 1.5 Mushroom research and development. (K1,K2)
- 1.6 National and international agencies. (K1,K2)

### **UNIT II: Pure culture for spawn production. (6 hours)**

- 2.1 Pure Culture- Media- Preparation. (K1,K2,K3)
- 2.2 Maintenance of mother culture in test tube slants -Petri plates - saline bottle - polypropylene bags. (K1,K2,K3)
- 2.3 Spawn production- spawning. (K1,K2,K3)
- 2.4 Types of spawning. (K1,K2,K3)
- 2.5 Compost and composting. (K1,K2,K3)
- 2.6 Storage and transportation. (K1,K2,K3)

### **UNIT III: Cultivation technology. (6 hours)**

- 3.1 Cultivation Technology - Infrastructure - culture rack. (K1,K2,K3)
- 3.2 Thatched house. (K1,K2,K3)
- 3.3 Substrates – vessels. (K1,K2,K3)
- 3.4 Inoculation methods. (K1,K2,K3)
- 3.5 Mushroom bed preparation. (K1,K2,K3)
- 3.6 Preservation technology- long term storage - short term storage. (K1,K2,K3)

### **UNIT IV: Edible mushrooms cultivated in India. (6 hours)**

- 4.1 Types and importance of edible mushroom cultivated in India. (K1,K2)
- 4.2 *Agaricus bisporus*. (K1,K2,K3)
- 4.3 *Pleurotus* sps. (K1,K2,K3)
- 4.4 *Volvariella volvacea* (K1,K2,K3)
- 4.5 *Calocybe indica*. (K1,K2,K3)
- 4.6 Mushroom contamination.(K1,K2)

## **UNIT V: Nutritional and Medicinal Value of mushroom. (6 hours)**

5.1 Nutritional value of mushrooms. (K1,K2)

5.2 Medicinal values of Mushroom. (K1,K2)

5.3 Preparation of low calorie foods – the mushroom recipes. (K1,K2, K3)

5.4 Marketing values of mushrooms in India. (K1,K2)

5.5 Export value of mushrooms. (K1,K2)

5.6 Poisonous Mushrooms. (K1,K2)

### **TEXT BOOKS:**

1. Shu-Ting Chang, Philip G.Miles, Chang S. T (2004).Mushrooms: Cultivation, nutritional value, medicinal effect and environmental impact, 2<sup>nd</sup> edition, CRC press. United States.
2. Suman B.C and Sharma V.P (2005) Mushroom Cultivation, Processing and Uses. 1<sup>st</sup> edition, Agribios (India) Publishers, Jodhpur.

### **REFERENCE BOOKS:**

1. Paul Stamets J.S and Chilton J. S. (2004.) Mushroom Cultivation: A practical guide to growing mushroom. Agarikon Press, Sathome.
2. Dubey R.C and Maheswari D.K (2012). A Text of Microbiology. Revised edition, S. Chand and Company Ltd., New Delhi.
3. Marimuthu, *et al.*, (1991). Oyster Mushroom. Department of Plant Pathology, TNAU, Coimbatore.
4. Tewari and Pankaj Kapoor S.C (1988). Mushroom Cultivation. 1<sup>st</sup> edition, Mittal Publication, Delhi.

### **OER:**

#### **DIGITAL LIBRARIES:**

1. <http://www.loc.gov/>
2. <http://library.clark.edu/>
3. <http://www.dli.ernet.in/>
4. <http://www.loc.gov/education/>

**USMBD20 – SKILL BASED ELECTIVE: NUTRACEUTICALS AND FUNCTIONAL FOODS**

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: V & VI	USMBD20	Nutraceuticals and functional foods	Theory	Skill Based Elective	2	2	100

**Course Objective:** To familiarize students on the basic nutraceutical constituents of different foods and its role in health benefits.

**Course Outcomes (CO):**

At the end of the course, the learners will be able to;

**CO1:** Explain the historical perspective, classification, scope and future prospects of nutraceuticals.

**CO2:** Discuss the nutraceuticals constituents present in various food products and the role of probiotics and prebiotics as nutraceuticals.

**CO3:** Analyze food as remedies for the common disorders.

**CO4:** Outline genetically modified plants which are commercially available and their applications.

**CO5:** Communicate the pharmaceutical applications of genetically engineered plants.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	L	L	H
CO2	H	H	H	H	L	H
CO3	H	H	H	L	M	M
CO4	H	M	H	M	M	M
CO5	H	M	H	M	M	M

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	L	H
CO2	H	H	H	H	L	H
CO3	H	H	H	L	M	M
CO4	H	M	H	M	M	M
CO5	H	M	H	M	M	M

**H – HIGH (3)**

**M – MODERATE (2)**

**L – LOW (1)**

## **COURSE SYLLABUS**

### **UNIT I: Basics of nutraceuticals. (6 hours)**

- 1.1 Introduction to nutraceuticals – The link between nutrition and medicine. (K1,K2)
- 1.2 Historical perspective. (K1,K2)
- 1.3 Sources of nutraceuticals. (K1,K2)
- 1.4 Classification of nutraceuticals. (K1,K2)
- 1.5 Scope. (K1,K2)
- 1.6 Future prospects of Nutraceuticals. (K1,K2)

### **UNIT II: Colonic functional foods. (6 hours)**

- 2.1 Colonic functional foods – Probiotics. (K1,K2)
- 2.2 Prebiotics. (K1,K2)
- 2.3 Synbiotics – Health aspects of functional colonic foods. (K1,K2)
- 2.4 Milk ingredients as functional foods. (K1,K2)
- 2.5 Brief idea about some Nutraceutical rich supplements e.g. Caffeine. (K1,K2).
- 2.6 Green tea. (K1, K2)

### **UNIT III: Food as remedies. (6 hours)**

- 3.1 Food as Remedies- An overview. (K1,K2)
- 3.2 Nutraceutical remedies for common disorders like Arthritis. (K1,K2)
- 3.3 Bronchitis and circulatory problems. (K1,K2)
- 3.4 Hypoglycemia and nephrological disorders. (K1,K2)
- 3.5 Liver disorders and Osteoporosis. (K1,K2)
- 3.6 Psoriasis and Ulcers. (K1,K2)

### **UNIT IV: Genetically modified foods as nutraceuticals. (6 hours)**

- 4.1 Wild crop and genetically modified crops- Definition and uses. (K1,K2)
- 4.2 Nutraceuticals from genetically modified foods: *Bacillus thuringiensis* corn. (K1,K2)
- 4.3 Indian Bt egg plant. (K1,K2)
- 4.4 Purple tomato - tearless onion. (K1,K2)
- 4.5 Rainbow cauliflower. (K1,K2)
- 4.6 Calgene- FLAVR SAVR tomato. (K1,K2)

### **UNIT V: Plant pharmaceuticals as nutraceuticals (6 hours)**

- 5.1 Nutraceuticals from plant pharmaceuticals. (K1,K2)
- 5.2 Beta-carotene in rice (Golden rice). (K1,K2)

- 5.3 Transgenic “heart-healthy” Canola oil. (K1,K2)
- 5.4 Edible vaccine. (K1,K2)
- 5.5 Hepatitis B vaccine in maize. (K1,K2)
- 5.6 Cholera vaccine in potatoes. (K1,K2)

**TEXT BOOKS:**

1. Robert E.C. Wildman (2016). Handbook of Nutraceuticals and Functional Foods. 2<sup>nd</sup> edition, CRC Press, Taylor and Francis Group. New York, London.
2. Kramer, Hoppe and Packer (2001). Nutraceuticals in Health and Disease Prevention. 1<sup>st</sup> edition, Marcel Dekker. Inc., New York.
3. Functional Foods Concept to product. Edited by Gibson R and Christine M Williams. Woodhead Publishing Limited.

**REFERENCE BOOKS:**

1. Sukhcharn Singh, Riar C.S and Saxena D.C (2015). Functional foods and Nutraceuticals. 1<sup>st</sup> edition, New India Publishing Agency, New Delhi.
2. Rotimi E.Aluko (2012). Functional foods and Nutraceuticals. 1<sup>st</sup> edition, Springer, New York.
3. Lillian E.Forman (2009). Genetically Modified foods. 1<sup>st</sup> edition, ABDO Publishing Company, Edina, United States.
4. Functional foods, nutraceuticals and natural products. Concepts and Applications. Edited by Dhiraj A. Vатtem, Vatsala Maitin.

**OER:**

**DIGITAL LIBRARIES:**

1. <http://www.loc.gov/>
2. <http://library.clark.edu/>
3. <http://www.dli.ernet.in/>
4. <http://www.loc.gov/education/>

## USMBE20 – SKILL BASED ELECTIVE: COSMETOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: V & VI	USMBE20	Cosmetology	Theory	Skill Based Elective	2	2	100

**Course Objective:** To provide adequate knowledge on cosmeceuticals, personal care and hygiene products and familiarize with the skills in formulation science required to scientifically design and develop products.

### Course Outcomes (CO):

At the end of the course, the learners will be able to;

**CO1:** Give information about significance of cosmetics and adulteration of natural products.

**CO2:** Formulate face packs, hair oils for different types of skin and hair.

**CO3:** Analyze the structure, function and types of skin.

**CO4:** Outline the biology of hair, hair growth cycle and scalp hygiene and utilize the natural herbs for skin, hair and oral care preparations.

**CO5:** Communicate the cosmeceutical applications of micro and macroalgae.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	H	L	L	H
CO2	H	M	H	L	L	H
CO3	H	M	H	L	L	H
CO4	H	M	H	L	L	H
CO5	H	M	H	L	L	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	L	L	H
CO2	H	M	H	L	L	H
CO3	H	M	H	L	L	H
CO4	H	M	H	L	L	H
CO5	H	M	H	L	L	H

**H – HIGH (3)**

**M – MODERATE (2)**

**L – LOW (1)**

## **COURSE SYLLABUS**

### **UNIT I: Cosmetics and its significance. (6 hours)**

- 1.1 Cosmetics – Definition and purpose. (K1,K2)
- 1.2 Classification of cosmetics. (K1,K2)
- 1.3 Significance and its importance. (K1,K2)
- 1.4 Stability of product forms and quality control. (K1,K2)
- 1.5 Adulteration of Natural products: Qualitative method of detection. (K1,K2)
- 1.6 Quantitative methods of detection of adulteration. (K1,K2)

### **UNIT II: Role of cosmetics in facial skin care. (6 hours)**

- 2.1 Structure and function of skin. (K1,K2)
- 2.2 Types of Skin. (K1,K2)
- 2.3 Differences between baby's skin and adult skin. (K1,K2)
- 2.4 Formulations of face packs for dry, oily and normal skins. (K1,K2, K3)
- 2.5 Herbal remedy for skin disorders- pimple, acne, boils, black heads, white heads, and open pores. (K1,K2, K3)
- 2.6 Skin care in different seasons. (K1,K2, K3)

### **UNIT III: Hair Care. (6 hours)**

- 3.1 Structure and function of hair. (K1,K2)
- 3.2 Types of hair and Hair growth cycles. (K1,K2)
- 3.3 Defects in hair shaft. (K1,K2)
- 3.4 Processes involved in hair growth and color formation in hair. (K1,K2)
- 3.5 Role of scalp hygiene. (K1,K2)
- 3.6 Formulations of hair oils and hair tonics- remedy for dandruff, premature greying and hair loss. (K1,K2,K3)

### **UNIT IV: Role of Herbs in Cosmetics / Herbal cosmetics. (6 hours)**

- 4.1 Hair care preparation: Henna, Amla (K1,K2,K3)
- 4.2 Hibiscus, Bhringaraj. (K1,K2,K3)
- 4.3 Skin Care preparation: Aloe vera. (K1,K2,K3)
- 4.4 Turmeric, Sandal wood. (K1,K2,K3)
- 4.5 Oral care preparation: Babool. (K1,K2,K3)
- 4.6 Neem, Clove. (K1,K2,K3)



## **UNIT V: Algae in Cosmetics. (6 hours)**

- 5.1 Microalgae and macroalgae- An introduction. (K1,K2)
- 5.2 Chlorophyceae (green algae). (K1,K2)
- 5.3 Phaeophyceae (brown algae). (K1,K2)
- 5.4 Rhodophyceae (red algae). (K1,K2)
- 5.5 Applications of algae in cosmetics: sunscreen, moisturizer, anti-aging,whitening and hair care. (K1,K2,K3)
- 5.6 Cosmetic products using algal metabolites. (K1,K2)

### **TEXT BOOKS:**

1. Pandey. H (2009),“ Herbal beauty products with formulations and processes”. Himalaya publishers.
2. Simon.Y.Mills(2000) , “ The essential book of herbal medicine”. 2<sup>nd</sup> edition . Elsevier.
3. Eliot Cowan (1996). “Plant spirit medicine: The healing power of plants”. CRC press. United states.

### **REFERENCE BOOKS:**

1. Sagrin C.B.( 2011). Cosmetic Science and technology. 1<sup>st</sup> edition. Wiley & Sons. United states.
2. Marc Paye, Andre. O. Barel.(2000). Handbook of Cosmetic Science and technology . CRC press, Unites states.
3. Surabhi Joshi, Roshani Kumari and Vivek N. Upasani. (2003). Applications of Algae in Cosmetics: An Overview. S. Chand and Company Ltd., New Delhi.

### **OER:**

#### **DIGITAL LIBRARIES:**

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2. <http://library.clark.edu/>
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## UEMBB20 - ELECTIVE I B: ENTREPRENEURIAL MICROBIOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: V	UEMBB20	Elective I B: Entrepreneurial Microbiology	Theory	Core Elective	4	4	100

**Course Objective:** To facilitate the students understanding on the concepts of entrepreneurship such as Planning, decision making, leadership, organizations and authority.

### Course Outcomes (CO):

At the end of the course, the learners will be able to;

**CO1:** Explain the historical development of industrial microbiology and outline on the importance of entrepreneur development and risk assessment.

**CO2:** Analyze the microbial cells as fermented products.

**CO3:** Demonstrate the procedures involved in mushroom cultivation and its storage method.

**CO4:** Utilize various microorganisms as biofertilizers.

**CO5:** Design and use patent in the development of entrepreneurship.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	L	H
CO2	H	H	H	L	L	H
CO3	H	M	M	M	M	M
CO4	H	H	H	M	M	H
CO5	H	H	H	M	M	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	M	H	H
CO2	H	H	H	H	M	H
CO3	H	M	H	M	L	M
CO4	H	H	H	M	L	H
CO5	H	H	H	L	L	H

**H – HIGH (3)**

**M – MODERATE (2)**

**L – LOW (1)**

## COURSE SYLLABUS

### UNIT I: **Entrepreneur Development.** (12 hours)

- 1.1 Entrepreneur development and activity. (K1,K2,K3,K4)
- 1.2 Institutes involved in Entrepreneurial development. (K1,K2,K3,K4)
- 1.3 Government contributions to Entrepreneurs. (K1,K2,K3,K4)
- 1.4 Risk assessment in Entrepreneurship. (K1,K2,K3,K4)
- 1.5 Industrial Microbiology- Definition and History. (K1,K2)
- 1.6 Scope of Industrial Microbiology. (K1,K2,K3)

### UNIT II: **Microbial cells as fermented products.** (12 hours)

- 2.1 Microbial cells as fermentation products – Brewers and Baker's yeast. (K1,K2,K3)
- 2.2 Food and feed yeasts. (K1,K2,K3)
- 2.3 Bacterial insecticides. (K1,K2,K3)
- 2.4 Legume inoculants - Algae. (K1,K2,K3)
- 2.5 Enzymes as fermentation products- bacterial and fungal amylases. (K1,K2,K3)
- 2.6 Enzymes as fermentation products - proteolytic enzymes. (K1,K2,K3)

### UNIT III: **Mushroom cultivation.** (12 hours)

- 3.1 History of Mushroom cultivation in India. (K1,K2)
- 3.2 Common edible mushrooms cultivated in India. (K1,K2)
- 3.3 Preparation of compost and composting. (K1,K2,K3)
- 3.4 Spawn and spawning. (K1,K2,K3)
- 3.5 Methods used in Cultivation of *Agaricus bisporous* and *Agaricus campestris*. (K1,K2,K3)
- 3.6 Methods used in Cultivation *Volvoriella volvaciae*. (K1,K2,K3)

### UNIT IV: **Biofertilizers.** (12 hours)

- 4.1 Chemical fertilizers versus biofertilizers. (K1,K2)
- 4.2 Biofertilizer- Historical background. (K1,K2)
- 4.3 Organic farming. (K1,K2,K3)
- 4.4 Methods involved in the production of Bacterial biofertilizers. (K1,K2,K3)
- 4.5 Methods involved in the production of algal biofertilizers. (K1,K2,K3)
- 4.6 The importance of *Rhizobium* sp., *Azospirillum* sp., *Azotobacter* sp., as biofertilizers. (K1,K2)

## **UNIT V: Patenting and Fermentation economics. (12 hours)**

- 5.1 Patent and secret process. (K1,K2)
- 5.2 History of patenting. (K1,K2)
- 5.3 Composition, subject matter for patenting. (K1,K2)
- 5.4 Characteristics of a patent, inventor, infringement, cost of patent. (K1,K2)
- 5.5 Patents in India and other countries. (K1,K2)
- 5.6 Fermentation economics. (K1,K2)

### **TEXT BOOKS:**

1. Arora (2009).Entrepreneurial Development .1<sup>st</sup> edition, Himalaya Publishing House, New Delhi.
2. Arora R and Sood S.K (2010). Entrepreneurship Development. 1<sup>st</sup> edition, Kalyani Publishers, New Delhi.
3. Batra G.S and Dangal R.C (2000). Entrepreneurship and Small Scale Industries. 1<sup>st</sup> edition, Deep & Deep Publications, New Delhi

### **REFERENCE BOOKS:**

1. Casida J.R (2005). Industrial Microbiology. 2<sup>nd</sup> edition, New Age International (P) Ltd., New Delhi.
2. SubbaRao NS (1997). Biofertilizer in Agriculture and Forestry, 3<sup>rd</sup> edition, Oxford &IBU Publications. New Delhi
3. Aneja K.R (2010). Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology, 6<sup>th</sup> edition, New age International Publication.
4. Anand Saxena (2005). Entrepreneurship Motivation, Performance, Reward. 1<sup>st</sup> edition, Deep & Deep Publication, New Delhi.
5. Anil Kumar S, Poornima S.C, Mini K and Jayashree K (2006).Entrepreneurship Development. 1<sup>st</sup> edition, New age international Publishers,New Delhi.
6. Batra G.S (2002). Development of entrepreneurship.1<sup>st</sup> edition, Deep & Deep Publication, New Delhi.

### **OER:**

#### **E- CONTENT FOR LEARNING:**

1. <http://www.learnerstv.com/>
2. <http://webcast.berkeley.edu/>
3. <http://cosmolearning.org/>
4. <http://www.world-lecture-project.org/>
5. <http://cec.nic.in/>
6. <http://epgp.inflibnet.ac.in/>
7. <http://www.co-learn.in/>