

## CRITERION II – TEACHING-LEARNING AND EVALUATION


### 2.6 STUDENT PERFORMANCE AND LEARNING OUTCOME

**2.6.1 Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the institution are stated and displayed on website and attainment of POs and COs are evaluated**

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## **PROGRAM OUTCOME AND PROGRAM SPECIFIC OUTCOME**

### **PG DEPARTMENT OF FOOD SCIENCE**

#### **MSC FOOD AND NUTRITION**

##### **Program outcome:**

<b>PO 1</b>	To provide quality education to make the students technically competent to face the challenges in the field of Food Science, Nutrition and Dietetics.
<b>PO2</b>	To impart knowledge and skills necessary to work in research laboratories, food industries, health sector and at the community level.
<b>PO3</b>	To synergize a new generation with professional competence to face the challenges of the food processing sector

##### **Program specific outcome:**

<b>PSO 1</b>	To provide advanced knowledge and skills in highly job oriented courses in the areas of Food Processing, Quality Control, Food Safety, and Nutritional Sciences.
<b>PSO 2</b>	To conduct need based multidisciplinary research for improving the livelihood of the community and the nation.
<b>PSO 3</b>	To identify food based strategies for alleviating nutritional problems to achieve nutrition and health security.
<b>PSO 4</b>	To develop entrepreneurial skills by providing skill development programmes in commercial food processing.

## PROGRAM OUTCOME AND PROGRAM SPECIFIC OUTCOME

### PG DEPARTMENT OF FOOD SCIENCE

#### MSC IN CLINICAL NUTRITION AND DIETETICS

##### Program outcome:

<b>PO 1</b>	Clinical Nutrition & Dietetics is a specialized area of nutrition that requires specific training. Clinical nutrition is concerned with therapeutic uses of nutrition, usually as part of a complete health care program.
<b>PO2</b>	Clinical Nutritionists create effective nutrition plans aimed at disease prevention and treatment, strengthening of the immune system, and nourishment of the body.
<b>PO3</b>	This subject teaches the students about food, components of food, diet and their role in physiological and biochemical changes in the body.
<b>PO4</b>	This course helps students to learn on basics of food and nutrients, metabolic pathways, physiology of different organs and their functioning, diet planning for different age groups, Different methods of cooking, Specific nutrition needs, food safety to know about sanitation and hygiene, diet for different disease conditions, food borne illnesses by microbes.
<b>PO5</b>	This course makes students equipped to learn the strategies to overcome problem of malnutrition and deficiencies through proper knowledge,
<b>PO6</b>	They also will learn about the role of physical activity and exercise in health, nutraceuticals and their benefits

##### Program specific outcome:

<b>PSO 1</b>	This course helps students to learn on basics of food and nutrients, metabolic pathways, physiology of different organs and their functioning.
<b>PSO 2</b>	After completing this course students will be able to plan diet for different age groups
<b>PSO 3</b>	They will understand about different methods of cooking
<b>PSO 4</b>	This course emphasizes on specific nutritional needs of a person
<b>PSO 5</b>	The students will understand importance of food safety and know about sanitation and hygiene, diet for different disease conditions, food borne illnesses by microbes
<b>PSO 6</b>	At the end of this course students understand Specific nutrition needs, how to overcome problem of malnutrition and deficiencies
<b>PSO 7</b>	They understand Role of physical activity and exercise in health, nutraceuticals and their benefits.

## **MACHINERIES, PACKAGING, LABELLING AND REGULATIONS**

CO 1	The course will help to understand the Emerging Packaging Technology, Edible Packaging Systems, Smart packaging, active and intelligent packaging technologies.
CO 2	It deals with: Food process equipment design, it gives insight about principles types performance and evaluation of food packaging system.
CO 3	This course emphasizes on Laws, Regulations and Guidance, Functions of Labelling. Students will gain knowledge on international food legislation & standards and Food safety

### **Formulations and Ready-to-Eat Technologies:**

CO 1	This course emphasizes on Introduction, need for convenience food and types, Advantages - Ready to eat/ ready to cook/ready to serve foods and its manufacturing process.
CO 2	It deals with Technology for the manufacture of bakery products, Extruded snack foods: Formulation and processing technology, Formulation of functional foods containing nutraceutical – stability and analytical issues.
CO 3	Students will understand the Formulation of special dietary foods; Formulation of nutrient rich foods; Therapeutic, Parenteral and Geriatric nutrition and relevant food formulations; formulation of therapeutic and probiotics foods, determination of Glycaemic index of selected foods.
CO 4	Formulation of Spread and Bakery Shorteners High Protein Foods Packaging of Ready to Eat Foods.

# PROGRAM OUTCOME AND PROGRAM SPECIFIC OUTCOME

## PG DEPARTMENT OF FOOD SCIENCE

### MVOC FOOD TECHNOLOGY AND QUALITY MANAGEMENT

#### Program outcome:

<b>PO 1</b>	It is a skill enhancement program for students interested in food technology and quality management sector and enhance employability in quality control department of food industry
<b>PO2</b>	This course helps students to become industry ready and gives life science students excellent opportunity to acquire skills and apply them in the 6 months industry internship which is a part of the curriculum.
<b>PO3</b>	This program will impart ability to apply principles to maintain quality of food in food industry.
<b>PO4</b>	This program will impart training in industry -oriented skills required in food technology and quality management in food industry

#### Program specific outcome:

<b>PSO 1</b>	It is a general course emphasizing Technology and quality control involved in food industry
<b>PSO 2</b>	After completing this course student will have a knowledge in food quality and management, Food chemistry, Food Safety Management Systems Food Fortification and Food Additives and Food product development and sensory evaluation.
<b>PSO 3</b>	It also emphasis on food and allied industries, safety, regulations, control and entrepreneurship in food sector.
<b>PSO 4</b>	It also deals with machineries, packaging, labelling and regulations and formulations in food industry.
<b>PSO 5</b>	It also deals with the basics of biochemical and microbiological techniques, fermentation and enzyme technology
<b>PSO 6</b>	It gives the learner the insight on biostatistics, research methodology which is a requisite if students want to go for research.
<b>PSO 7</b>	The course emphasizes on improving the practical sk Techniques in Food Processing , Analytical techniques in food industry, methodologies in enzyme technology and fermentation, quality control and quality assurance, industrial practices in food industries, practices in biochemical and microbiological techniques.
<b>PSO 8</b>	Practical application and theory for one and half year along with project work for product development at college and six months on job training in the industry will make the student industry ready.

## PROGRAMME OUTCOMES

### MSc. BIOTECHNOLOGY

Upon completion of the MSc. Biotechnology Programme, the candidate should be able to

<b>PO1</b>	Understand the basic knowledge and concepts of biotechnology and other interdisciplinary subjects
<b>PO2</b>	Ability to apply their knowledge in experiments which they can conduct independently
<b>PO3</b>	practical exposure to the basic and the advanced fields of biotechnology
<b>PO4</b>	Gain practical knowledge about advanced subject area like nanobiotechnology, multi omics, immunotechnology, and animal, plant and agriculture biotechnology
<b>PO5</b>	Advancement of their professional career and employment in diverse areas of biotechnology
<b>PO6</b>	Student can solve, analyze and interpret data generated from experiments done in project work or practical courses
<b>PO7</b>	Learn modern analytical tools/ software/ equipments and analyze and solve problems in various courses of biotechnology

#### Programme Specific Outcome

<b>PSO1</b>	Students will be able to Understand and apply their knowledge of Animal Biotechnology, Plant Biotechnology, cell biology, biochemistry, microbiology to solve the problems related to the field of biotechnology
<b>PSO2</b>	Apply their knowledge in performing experiments
<b>PSO4</b>	Gain practical knowledge about advanced subject area like nanobiotechnology, multi omics, immunotechnology, and animal, plant and agriculture biotechnology
<b>PSO5</b>	Advancement of their professional skill and employment opportunity in diverse areas of biotechnology
<b>PSO6</b>	Student can solve, analyze and interpret data generated from the laboratory
<b>PSO7</b>	Learn various analytical tools/ software/ equipments and solve problems in various courses of biotechnology

## MSc. Microbiology Programme Outcomes

<b>PO1</b>	Acquire knowledge on fundamentals and advanced aspects of microbiology
<b>PO2</b>	Understand details of bacterial, fungal, algal and viral morphology and physiology
<b>PO3</b>	Student will able to cultivate and characterize bacterial and fungal strains, immune function and recombinant DNA technology
<b>PO4</b>	Able to understand the concepts and development of microbial diseases in animals & plants
<b>PO5</b>	Will have gained in-depth knowledge about basic and advanced microbiology which lead to various career opportunity

## Programme Specific Outcome

<b>PSO1</b>	Students will gain knowledge in principles and applications of microbiology to be applied in various field
<b>PSO2</b>	Enrich research knowledge and understanding of the microbiology and can apply in various research and innovation.
<b>PSO4</b>	Students will be able to understand methodologies based on modern techniques to be used in research institutions and other industries.
<b>PSO5</b>	Eligible for pursuing higher education (M.Phil, Ph.D) in the different fields. Eligible to qualify various examinations such as CSIR-NET, ARS-NET GATE,ICMR, DBT-BET and many other examination.
<b>PSO6</b>	Students can start entrepreneurship ventures such as consultancy, diagnostic centre and other industries
<b>PSO7</b>	Fetch career opportunities for students with microbiology background in various countries.

### **MSc. BIOCHEMISTRY Programme Outcomes**

<b>PO1</b>	Skill Development: Master academic, technical, managerial and crucial soft skills to qualify for careers in research, industry, education, administration and management or for higher studies where a holistic understanding of applied biosciences is required
<b>PO2</b>	Communication: Acquire effective communication and creative expression skills in the form of writing, design, presentation and networking to convincingly articulate scientific ideas in biosciences and related fields
<b>PO3</b>	Research: Develop a scientific mindset with the capacity for analytical and innovative thinking and practical knowhow to formulate, design and ethically implement scientific research in frontier areas of Biochemistry, Biotechnology and Microbiology
<b>PO4</b>	Employment and Entrepreneurship: Acquire the necessary knowledge and proficiencies to become employable or get self-employed and thereby create job opportunities through entrepreneurship in health, agriculture, industry, environment and allied areas of applied biosciences and thereby affirmatively contribute to scientific social responsibility.

### **Programme Specific Outcome**

<b>PSO1</b>	Demonstrate an understanding of structure and metabolism of macromolecules and understand the regulation and disorders of metabolic pathways
<b>PSO2</b>	Gain proficiency in laboratory techniques in both biochemistry and molecular biology, and be able to apply the scientific method; these technologies help to address the biological and medical challenges faced by humankind
<b>PSO3</b>	Acquire thorough knowledge in biochemical techniques, immunology, physiology and Biotechnology
<b>PSO4</b>	Learn to work as a team as well as independently to retrieve information, carry out Research investigations and result interpretations
<b>PSO5</b>	Develop the ability to understand and practice the ethics surrounding scientific Research
<b>PSO6</b>	Realize the impact of science in society and plan to pursue research



**COURSE OUTCOME**  
**MSc. MICROBIOLOGY**

**MBH 101: Bacteriology and Virology**

CO1	The basic concepts of classification, nomenclature and recent advances in the microbial taxonomy can be learned.
CO2	Structure, cellular components and reproduction of bacteria can be studied.
CO3	Nutritional requirement and different cultivation techniques can be learned.
CO4	Nomenclature and classification of the virus can be studied
CO5	Knowledge about the different viral cultivation techniques will be gained.

**MBH 102: Eukaryotic microbiology**

CO1	Importance of protozoa, their structure and cultivation can be learnt.
CO2	Isolation, cultivation and classification of algae and their reproduction will be studied.
CO3	Knowledge with respect to the applications part of algae in food, fuel and therapeutics will be gained.
CO4	Structure, growth and reproduction of different fungi will be studied.
CO5	Classification of fungi and their importance in various field will be learnt.

**MBH 103: Microbial Physiology and Biochemistry**

CO1	Complete information regarding the microbial metabolites, stress response in microbes and bioluminescence in microbes will be gained.
CO2	Definition of enzyme their mechanism of action and kinetics will be studied.
CO3	Metabolism of carbohydrate, fermentation pathways, bioenergetics and energy production will be taught.
CO4	Students will be gaining knowledge in the field of lipid classification, structure and their biosynthesis pathways.
CO5	Structure of nucleic acid, and the synthesis of purines and pyrimidine's will be taught to the students.

**MBH 104: Microbial and Biochemical techniques**

CO1	Different isolation techniques, and preservation of microorganism will be learnt by the students.
CO2	Different microbial growth measuring techniques will be taught to students.
CO3	Students will be learning about the concepts like metagenomics.
CO4	Different Spectrophotometry, spectroscopy, chromatography, electrophoresis techniques will be taught to students.
CO5	Different isotopes, their labelling and safety guidelines will be taught to the students.

PROGRAM OUTCOME AND PROGRAM SPECIFIC OUTCOME  
MASTER OF COMMERCE

Program Outcome:

PO 1	Demonstrate professional skills for global employability and lifelong learning.
PO 2	Apply the knowledge of accounts, taxes, management fundamentals and corporate practices to find the solution for problems in business and commerce.
PO 3	Application of strategies in their job/work by the contextual knowledge to various accounting and finance concepts.
PO 4	Conduct business ethically follow professional ethics, responsibilities and norms

Program specific outcome:

PSO 1	Apply relevant knowledge and financial tools in manufacturing and service operations of the nation and region.
PSO 2	Demonstrate technical and decision making skills in the areas of national taxation, global accounting, finance and banking.
PSO 3	Formulate organizational decisions through applied research in commerce.
PSO 4	Identify, formulate, review research literature, and analyse complex business problems reaching substantiated conclusions using principles and practices of accountancy and general management techniques.

## M.SC FOOD AND NUTRITION

### Course Outcome

#### HSFN 101 - HUMAN PHYSIOLOGY

CO1	Enable the students to understand the integrated function of all body systems
CO2	Advance their understanding of some of the relevant issues and topics of human physiology
CO3	Enables students study the recent advances in human physiology
CO4	Acquire basic knowledge on Human Physiology

#### HSFN 102 - NUTRITIONAL BIOCHEMISTRY

CO1	Enables student to acquire knowledge on biochemistry at the undergraduate level.
CO2	Make students to become proficient for specialization in nutrition and dietetics.
CO3	Attains understanding on integration of cellular level metabolic events to nutritional disorders and imbalances.
CO4	Students acquire knowledge on nutritional biochemistry

#### HSFN 103 - HUMAN NUTRITION

CO1	Provides in-depth knowledge of the physiological and metabolic role of macro and micro nutrients and their importance in human nutrition.
CO2	Students get familiarise with the recent advances in nutrition and apply this knowledge in planning for public health programme.
CO3	Enables the students to translate the knowledge into practical guidelines for dietary needs of human nutrition at different stages of life.

#### HSFN 104 - RESEARCH METHODOLOGY

CO1	Student develops a scientific approach and understand the process of research
CO2	Enables students to develop the competence for selecting methods and tools appropriate for research topics
CO3	Prepares the students to design and carry out research studies in the field of food and nutrition

### **HSFN 105 - FOOD PRESERVATION**

CO1	Students gain knowledge about principles and methods of food preservation
CO2	Students will have an in-depth knowledge about types of food preservation
CO3	Attains understanding on the preservation by high temperature like dehydration, canning
CO4	Learns about the preservation by low temperature by chilling and freezing
CO5	students enhance their knowledge about irradiation, fermentation, preservation by preservatives
CO6	Learns about different packaging used in food industry and its advantages and disadvantages

### **HSFN 201 - STATISTICS**

CO1	Enables students apply statistical techniques to research data for analyzing and for interpretation of data.
CO2	Enables students to summarize data and present it using tables and graphs.
CO3	Attains knowledge to understand the components of research proposals.

### **HSFN 202 - FOOD SCIENCE**

CO1	Students understand the role of nutrition in different stages of life span
CO2	Provides the guidelines for Adequate Nutrition throughout life span
CO3	Students get acquainted with growth, development and physiological changes during pregnancy lactation and infancy
CO4	Enables to understand the interrelationship between nutrition and growth and development during these phases

### **HSFN 203 - NUTRITION THROUGH LIFE SPAN**

CO1	Provides an understanding of composition of various food stuffs
CO2	Familiarise students with changes occurring in various foodstuffs as a result of processing and cooking
CO3	Enable students to use their theoretical knowledge in various applications and food preparations
CO4	Familiarise the students with the recent trends in food science

### **HSFN 204 - FOOD SANITATION AND HYGIENE**

CO1	Enable the students to inculcate the sanitary aspects of safe of handling food
CO2	Helps the students gain knowledge of personal and environmental hygiene
CO3	Learn more about hygiene and sanitation

### **HSFN 205 – SOFT CORE-FOOD MICROBIOLOGY**

CO1	Familiarizes the students with recent advances in food microbiology
CO2	Learn concepts of fermented foods, dairy, food preservation, detection of food-borne diseases, their control measures.
CO3	Gains consciousness on types of food spoilage, sterilization techniques
CO4	Acquires awareness on dairy products, cereal products, and fish meat products and their sources of contaminations

### **HSFN 301 - CLINICAL NUTRITION AND DIETETICS - I**

CO1	Student understands the biochemical and Physiological impartments in diseases.
CO2	Student understands the role of Nutrition for good
CO3	Obtains knowledge of dietary factors and dietary management of various diseases
CO4	Develops capacity and attitude for taking up dietetics as a profession

### **HSFN 302 - PUBLIC HEALTH NUTRITION**

CO1	Students gain insight into the national nutritional Problems and their implications in diseases
CO2	Familiarise the students regarding the preventive measures and management of nutritional problems
CO3	Develops the skills in organising and evaluating nutrition projects in the community

### **HSFN 303 - FOOD SERVICE MANAGEMENT**

CO1	Student develops knowledge in areas of institutional food administration
CO2	Provides practical field level experience in institutional food administration
CO3	Impacts necessary expertise to function as a food service manager
CO4	Equips students to start their own food service unit leading to entrepreneurship

### **HSFN 304 - PHYSICAL FITNESS**

CO1	Students understand the components of health and fitness and the role of Nutrition
CO2	Attains dietary and physical activity recommendations to achieve fitness and well being
CO3	Develops ability to evaluate fitness and wellbeing
CO4	Enables student to know the significance of sports nutrition components

### **HSFN 305 – CYBER SPACE**

CO1	To educate about the regulation of cyber space at national and international level.
CO2	To enhance the understanding of problems arising out of online transactions and provoke them to find solutions
CO3	To understand the history of internet and understand the timeline under which it has evolved

### **HSFN 401 - CLINICAL NUTRITION AND DIETETICS - II**

CO1	Student understands the biochemical and Physiological impairments in diseases.
CO2	Obtain knowledge of dietary factors and dietary management of various diseases/ disorders
CO3	Learns more about clinical nutrition

### **HSFN 402 - NUTRITION IN CRITICAL CARE**

CO1	This course enables the student to understand the physiology, metabolism and special nutritional requirements of the critically ill.
CO2	Familiarizes with the special nutritional support techniques and feeding formulations of critically ill to meet their nutritional needs
CO3	Enables students to gain knowledge on nutrition in critical care

### **HSFN 403 - NUTRITION IN EMERGENCIES AND DISASTERS**

CO1	Familiarizes students with various natural and emergencies and disasters having an impact on nutrition and health status
CO2	Enables student to understand the Special nutritional arising out of these situations
CO3	Understands the strategies for nutritional rehabilitation management of the health of emergency affected populations
CO4	Enables students to gain knowledge on nutrition in emergencies and disasters

## **HSFN 404 - FOOD ADULTERATION AND FOOD ADDITIVES**

CO1	Enables the students to identify the commonly used adulterants in food
CO2	Helps students to know the different food additives used and the role of additives in food science.
CO3	Gains knowledge on food adulteration and food additives

## M. Sc CLINICAL NUTRITION & DIETETICS

### SEMESTER – I COURSE OUTCOME:

#### **CND 101: Human Physiology**

CO1	To understand the structure of various organ systems in the human body
CO2	To understand the integrated functions of various organ systems in the human body
CO3	To understand the role of various organs in the maintenance of health
CO4	To describe the organization of tissues and organs
CO5	To understand the basic and advanced physiological processes, and analyse their biological meaning, regulation and integration

#### **CND 102: Fundamentals of food and nutrition**

CO1	To understand the concept of meal preparation
CO2	To understand the role of hospital food service system
CO3	To provide students with the knowledge of basic terminology and several aspects of nutrition and the functions of food in healthy life sustenance
CO4	To understand the basics of nutrient requirement
CO5	To understand the various functions of food and its role in day-to-day life

#### **CND 103: Human Nutrition**

CO1	To understand the factors affecting nutrient absorption
CO2	To highlight the physiological and metabolic role of nutrients and their relationship to human health and well-being
CO3	To understand the health problems associated with nutrient deficiency or toxicity
CO4	To determine the various methods of energy expenditure and the factors affecting it
CO5	To understand the role of nutrients – both macro and micro – in maintain health of an individual



### **CND 104: Metabolism**

CO1	To get an insight into interrelationships between various metabolic pathways.
CO2	To understand the mechanisms adopted by the human body for regulation of metabolic pathways.
CO3	To understand the role of catabolic and anabolic pathways in cellular metabolism
CO4	To understand the role of free radicals and antioxidants in health and disease
CO5	To understand the metabolic disorders of various hormones and enzymes

### **CND 105: Research methodology & scientific writing**

CO1	To identify, compare and prepare the key elements of a research proposal
CO2	To develop skills in qualitative and quantitative data analysis
CO3	To learn the various aspects of research process
CO4	To develop advanced critical thinking skills in students
CO5	To inculcate scientific and inductive thinking in students

### **SEMESTER – II COURSE OUTCOME:**

#### **CND 201: Life cycle and Nutrition**

CO1	To relate food and nutrients to the biological requirements of humans at different stages of life cycle
CO2	To understand the nutrition-related concerns specific to each stage of the human life cycle to consequences for health and disease
CO3	To reflect upon the consequences of physical, biochemical, physiological, social and psychological factors impacting nutritional intake and status during each stage of the human life cycle
CO4	To design food plans to meet the needs of humans at various life cycle stages
CO5	To understand the developmental stages of infant during pregnancy and lactation

### **CND 202: Clinical nutrition and Diet therapy-I**

CO1	To understand the basic principles of diet and diet therapy
CO2	To acquire knowledge of modifications of normal diet for therapeutic purposes
CO3	To acquire the skills and techniques involved in the planning and preparation of therapeutic diets for various ailments
CO4	To develop the capacity and attitude for taking dietetics as a profession
CO5	To apply the different diets for patients appropriately

### **CND 203: Food microbiology and food safety**

CO1	To understand the microorganisms in foods and its relation to health
CO2	To study about contaminated food and infectious diseases
CO3	To understand the importance and significance of microorganisms in food
CO4	To understand the factors influencing food spoilage
CO5	To study the various food borne diseases

### **CND 204: Public health Nutrition**

CO1	To gain knowledge on the current nutritional scenario
CO2	To understand the policies towards nutritional security
CO3	To gain knowledge of the various existing public health programmes and to understand its functioning and role towards public
CO4	To learn about the policies and improve nutritional status of public.
CO5	To understand the role of nutritionist in educating the public about nutrition.

### **CND 205: Biostatistics**

CO1	To learn basic statistical procedures for research
CO2	To understand applications of statistical techniques for analysis and interpretation
CO3	To use selective software for qualitative and quantitative data analysis
CO4	To understand the basic principles and applications of probability
CO5	To learn about various statistical tests

## **SEMESTER – III COURSE OUTCOME:**

### **CND 301: Nutrition in physical fitness**

CO1	To understand the role of nutrition in management of health
CO2	Understand the role of physical activity in management of health
CO3	To understand the composition of human body and its changes through life cycle
CO4	To understand the physiological changes during physical activity in various organ systems of the body
CO5	To gain knowledge on the anti-doping regulations and the various organizations involved in its making

### **CND 302: Nutrigenomics and Nutraceuticals**

CO1	To familiarize students with the basic concepts in nutritional genomics and to develop an understanding of genomics and gene regulation with respect to diet and to obtain an appreciation for the role and importance of nutrition in prevention of polygenic diseases.
CO2	Students will gain knowledge to apply nutrigenomics and to design nutritional strategies for prevention of chronic diseases such as cardiovascular disease, obesity, type-2 diabetes and cancer.
CO3	To gain knowledge of the various phytochemicals and their potential health benefits
CO4	To understand the role of nutraceuticals and functional foods in pediatrics, geriatrics, sports, pregnancy and lactation
CO5	To understand the concepts of nutraceuticals through traditional food and medicine.

### **CND 303: Nutrition and diet counseling**

CO1	To understand the principles methods of diet counselling
CO2	To apply the counselling methods to patients with different diseases
CO3	To acquire skills in diet counselling and feeding of patients
CO4	To gain knowledge in handling hospitalized patients
CO5	To analyse the food habits and bring about the dietary changes in patients

## **SEMESTER – IV COURSE OUTCOME:**

### **CND 401: Nutrition in critical care and emergencies**

CO1	To gain knowledge in handling hospitalized patients
CO2	To know the nutritional assessment of ill patients
CO3	The students will be able know nutrition support systems during emergency
CO4	To understand the physiology, metabolism and special nutritional requirements of the critically ill
CO5	To be familiar with the special nutritional support techniques and feeding formulations to meet their nutritional needs

### **CND 402: Clinical Nutrition & Diet therapy-II**

CO1	To understand the etiology, physiology and metabolic anomalies of acute and chronic diseases and patient needs
CO2	To learn the effect of the various diseases on nutritional status and nutrient and dietary requirements
CO3	The students will be able to intervene the metabolic anomalies of acute and chronic diseases.
CO4	The students will be able to plan menu for various diseases based on their nutritional status and dietary needs.
CO5	To understand the risk factors for degenerative diseases and towards the management of several disease conditions

### **CND 403: Drug and nutrient interaction & Toxicology**

CO1	To understand critical mechanism of drug nutrient interaction and toxicity in humans
CO2	To develop critical appraisal related to clinical toxicology
CO3	To grasp the role of addictive drugs in toxicology
CO4	To describe typical poisoning of selected drugs
CO5	To understand the impact of maternal-fetal toxicology

## PROGRAM OUTCOME AND PROGRAM SPECIFIC OUTCOME

### PG DEPARTMENT OF FOOD SCIENCE

#### MVOC FOOD PROCESSING AND NUTRACEUTICALS

##### Program outcome:

<b>PO 1</b>	This program will impart ability to apply principles of food processing and Nutraceutical in the respective industry.
<b>PO2</b>	This program will impart training in industry -oriented skills required for Food and Nutraceutical Industry
<b>PO3</b>	This course helps students to become industry ready and gives life science students excellent opportunity to acquire skills and apply them in the 6 months industry internship which is a part of the curriculum there by enhances employability in food and nutraceutical sector
<b>PO4</b>	This program nurtures the local talent and create an ecosystem of entrepreneurship in food and nutraceutical sector

##### Program specific outcome:

<b>PSO 1</b>	It is a general course emphasizing on technology and techniques involved in food processing & nutraceuticals, chemistry of food and nutraceuticals, food safety and standards.
<b>PSO 2</b>	It also emphasis on food and allied industries, nutraceutical industry, safety, regulations, control and entrepreneurship in food and nutraceutical sector.
<b>PSO 3</b>	It also deals with machineries, packaging, labelling and regulations and formulations and ready to eat technologies in food and nutraceuticals industry.
<b>PSO 4</b>	It also deals with the basics of biochemical and microbiological techniques, fermentation, enzyme technology, nutrition and metabolism of macromolecules.
<b>PSO 5</b>	It gives the learner the insight on biostatistics which is a requisite if students want to go for research.
<b>PSO 6</b>	It emphasizes on soft skills required for a learner to improve their communication and soft skills.
<b>PSO 7</b>	The course emphasizes on improving the practical skills on methodologies in food processing, techniques in food and nutraceuticals industry, methodologies in enzyme technology and fermentation, quality control and quality assurance, industrial practices in food and nutraceuticals and practices in biochemical and microbiological techniques.
<b>PSO 8</b>	Practical application and theory for one and half year along with project work for product development at college and six months on job training in the industry will make the student industry ready.

**COURSE OUTCOME**  
**MVOC FOOD PROCESSING AND NUTRACEUTICALS**  
**I SEMESTER**

**FOOD PROCESSING AND NUTRACEUTICALS TECHNOLOGY**

CO 1	Students will be introduced to scope of food processing and nutraceutical industry – Indian scenario; opportunities and domains of food processing sectors; skills required in the different sectors: dairy, vegetable, fruits, beverages, spices processing sectors; government policies: FICSI.
CO 2	Comparative analysis of food processing sector in India and Europe.
CO 3	The students will understand the quantitative and qualitative analysis of food additives, effect of processing on the food, sensory evaluation and the different scales associated with it.
CO 4	Students will be gaining knowledge in principles of food processing, food preservation and nutraceutical processing. It also deals with food and nutraceutical resources.

**CHEMISTRY OF FOOD AND NUTRACEUTICALS**

CO 1	The objective of this course is to teach the students about the chemistry of food and it's related to its composition such as water and other macro and micro molecules.
CO 2	It also teaches about chemistry of food additives.
CO 3	They will be understanding the techniques of biochemistry like estimation of carbohydrates, proteins, lipids, food additives.
CO 4	They will understand biochemical changes during processing and preservation, and chemistry of nutraceutical, they will also be able to do nutritive analysis by proximate analysis.

**BASIC TECHNIQUES OF FOOD PROCESSING AND NUTRACEUTICALS**

CO 1	The objective of this course is to teach the students about the extraction techniques involved
CO 2	In extraction of active ingredients, chromatographic techniques used for purification, spectroscopic and electrophoretic methods involved in identification of active ingredients in food and nutraceutical industry.
Co 3	It emphasizes on the different types and importance of food measurements in food industry.

## FOOD SAFETY AND STANDARDS

CO 1	This course deals with concept and meaning of food quality, food safety and food quality management.
CO 2	Food safety laws and standards hazard analysis, safety evaluations and quality control in food and nutraceutical industry.
CO 3	The students will know the how to be safe and secure at work place, keeping the work station clean, reporting and documentation in quality and will develop the interpersonal skills.
CO 4	Students will be aware of food safety acts in India and in the world.

## BIOSTATISTICS

CO 1	This course define the principal concepts about biostatistics. Recognize the definition of statistics, its subject and its relation with the other sciences.
CO 2	Restate the principal concepts about biostatistics. Collect data relating to variable/variables which will be examined and calculate descriptive statistics from these data.
CO 3	Identify data relating to variable/variables. Identify convenient sample by using sampling theory.
CO 4	Identify distribution form relating to the variable/variables. Recognize normal distribution. Interpret data via normal distribution.
CO 5	Define the principal concepts of probability. Recognize the binomial distribution. Interpret data via binomial distribution. Apply hypothesis testing via some of the statistical distributions.
CO 6	Define some concepts about hypothesis testing. Apply hypothesis testing to the data through these concepts. Arrange the results of the hypothesis testing and make a statistical decision.

## II SEMESTER

### FERMENTATION AND ENZYME TECHNOLOGY

CO 1	Aim of the course is the knowledge of the fermentative processes used in the industrial production of primary and secondary metabolites, biomasses and recombinant proteins.
CO 2	Bacteria, yeasts, moulds and mammalian cells are used in batch fermentation, fed batch fermentation, continuous culture, and continuous culture with cell/substrate recycle.
CO 3	Kinetics of microbial growth and product formation in industrial fermentation processes will be described.
CO 4	Distinguish the fundamentals of enzyme properties, nomenclatures, characteristics and mechanisms.
CO 5	It helps to understand and apply biochemical calculation for enzyme kinetics, compare methods for production, purification, characterization and immobilization of enzymes, discuss various application of enzymes that can benefit human life, discover the current and future trends of applying enzyme technology for the commercialization purpose of biotechnological products. Plot graphs based on kinetics data.

### NUTRITION AND METABOLISM

CO 1	The students will be able to describe the structure of Macromolecules and identify the major class of macromolecules to which it belongs.
CO 2	List the stages in the catabolism of food molecules and describe what occurs during each stage.
CO 3	Describe the biochemistry process, basic concept of human nutrition and the relationship of the consumption of foods to nutritional status and health.
CO 4	Evaluate the biological functions of foods for health in addition to nutritional values.
CO 5	Evaluate the potential for adverse events related to dietary supplements. Apply their knowledge in food biochemistry and nutrition in designing new range of products with improved nutritional characteristic



### III SEMESTER

#### FOOD AND ALLIED INDUSTRIES

CO 1	This course will help students to understand General principles and technology of food processing,
CO 2	It also deals with Agro-based products and it's processing along with Poultry, meat and fish processing industry.
CO 3	It imparts the knowledge in processing of Milk and dairy products.
CO 4	The knowledge of Processing in Beverage industry, Spices and spice oleoresins – Bakery, sugar and confectioneries products industry will be imparted.

#### NUTRACEUTICALS INDUSTRY

CO 1	On successful completion of this course students will be understanding the concepts related to Organizational elements, classification of nutraceutical, dietary supplements, fortified foods, functional foods and phytonutraceuticals.
CO 2	Scope involved in the industry, Indian and global scenario
CO 3	They will also know the practical skill of extraction phytochemicals along with quantitative and qualitative analysis

#### BIOCHEMICAL AND MICROBIOLOGICAL TECHNIQUES

CO 1	The student will understand the basic concepts and measurements of solution Separation and identification of active ingredients in food and Nutraceutical Industry by chromatography and electrophoretic techniques.
CO 2	They will be well versed with analytical and advanced analytical techniques.
CO 3	On successful completion of the course they will understand microbiological and staining techniques.

#### SAFETY REGULATIONS, CONTROL AND ENTREPRENEURSHIP

CO 1	From this course they will get the knowledge of Essentials of quality control, Quality Assurance.
CO 2	The students will know the how to be safe and secure at work place, keeping the work station clean, Reporting and documentation in quality and will develop the Interpersonal Skills.
CO 3	Students will be aware of food safety acts in India and in the world.

CO 4	Students will also understand the importance of labelling and its regulation. They will know about ethics and environmental concerns with respect to food and nutraceutical industry in processing as well as research.
CO 5	They will understand biosafety levels, biosafety cabinets, biosafety guidelines. Students will also understand the environmental release of GMOs, carto gene protocol, the student will acquire knowledge required for starting a business.

### **SOFT SKILLS**

CO 1	The student will Develop effective communication skills (spoken and written).
CO 2	Develop effective presentation skills.
CO 3	Conduct effective business correspondence and prepare business reports which produce results.

### **COURSE OUTCOME**

#### **MVOC FOOD TECHNOLOGY AND QUALITY MANAGEMENT**

## M. VOC FOOD TECHNOLOGY AND QUALITY MANAGEMENT

### COURSE OUTCOME

#### I SEMESTER

##### FOOD PROCESSING TECHNIQUES- I

CO 1	Students learn the basic types of food processing.
CO 2	Effect of processing on physical properties, sensory and nutritive value of foods and chemical changes in food.
CO 3	They will understand the functional properties of food.
CO 4	Students will learn basic and advanced techniques of food preservation.

##### FOOD BIOCHEMISTRY

CO 1	To acquaint various functional chemical constituents in food.
CO 2	To build a relationship between the dynamic forces of food and the dynamic forces of digestion and growth.
CO 3	To enable the students to Acquire knowledge on the macro and micro constituents of the food.
CO 4	Know the structure and chemical characteristics of constituents of food.

##### PRINCIPLES OF ANALYTIC CHEMISTRY

CO 1	Students gain knowledge about different methods of investigation used in the analysis of foods.
CO 2	And biochemical assay and about different instruments used in food analysis.
CO 3	They will understand the principles and applications of different techniques used in food and nutrition research.

##### BASICS OF FOOD MICROBIOLOGY

CO 1	Enable the students to gain an insight into basic aspects of food microbiology.
CO 2	Students will acquire knowledge and understanding of different food micro organisms
CO 3	Different techniques used in its detection.
CO 4	Students will understand causes of food spoilage by different foods and its type

## RESEARCH METHODOLOGY

CO 1	Students can understand the scientific approaches to research and to understand the significance of research methods in food.
CO 2	They will learn and identify the sources of variability and uncertainty in research.
CO 3	Students can understand the importance of scientific writing and develop competence in writing skills.
CO 4	They will gain knowledge about drafting research proposal and publish scientific paper.

## SEMESTER II

### FOOD PROCESSING TECHNIQUES –II

CO 1	Students learn the structure, composition and technology of cereals, pulses, oilseeds, fruits and vegetable and milk, sugar and animal foods processing.
CO 2	They also learn about various pre-processing and processing techniques needed for food industry.

## FERMENTATION AND ENZYME TECHNOLOGY

CO 1	After completion of the course, student acquire a detailed knowledge of number of products which are produced by industrial fermentation processes.
CO 2	They will be able to explain the production of industrial products from microorganisms using fermentation.
CO 3	They gain in depth knowledge about the enzymes in food industry and to comprehend the scale up and large-scale production.

## FOOD SAFETY MANAGEMENT SYSTEMS

CO 1	After completion of this course the student learn the Various elements and techniques of food safety.
CO 2	The student will be able to comprehend the techniques like GMP, GHP, ISO, HACCP and HARPC.
CO 3	The students will have thorough knowledge of basic elements of quality control and safety evaluation of foods and quality standards like AGMARK, CAC and FSSAI.

## **FOOD FORTIFICATION AND FOOD ADDITIVES**

CO 1	This course helps to understand basis of fortificants, selection.
CO 2	Use of specific food vehicles, food laws for fortification, Technology of fortifying cereal products, beverages, candies, snack products.
CO 3	Role of additives in processed foods, Sweetening agents, colouring agents and flavouring agents used in processed food industry.

## **SEMESTER III**

### **FOOD AND ALLIED INDUSTRIES**

CO 1	At the end of the course the students will be able to know about the different principles and technology of food processing.
CO 2	Followed in different industries like milk, beverage, Bakery and meat industry.

### **FOOD QUALITY SYSTEM AND MANAGEMENT**

CO 1	At the end of the course the students will be able to, explain the application of food quality and food safety system.
CO 2	Identify the hazard of the food chain to ensure food safety.
CO 3	Examine the chemical and microbiological quality of food samples, Review of food quality and standards.

### **PACKAGING, LABELING AND THEIR REGULATIONS**

CO 1	After completion of this course students can learn about the basics of food packaging, different packaging materials, and packaging material suitable for different processing methods.
CO 2	The students can gain knowledge in packaging laws and standards and applications of food packaging technology in food industry.

## **FOOD PRODUCT DEVELOPMENT AND SENSORY EVALUATION**

CO 1	This course presents to understand basis of Food and new Product Development.
CO 2	Role of sensory evaluation in consumer product acceptance and types of sensory tests used in food product development.
CO 3	Consumer behaviour in purchasing processed food and Packaging of new products.
CO 4	Safety concerns related to new product development.

## **SEMESTER IV**

### **INDUSTRY INTERNSHIP**

### **MBH-201: MICROBIAL GENETICS**

CO1	Students acquired sound knowledge about Prokaryotic and Eukaryotic genome, genome size, karyotype, types of chromosomes were.
CO2	Gene mutation, genetic recombination concepts were explained.
CO3	Gene transfer mechanisms, bacterial transformation, cytoplasmic inheritance were well understood by students.
CO4	Bacteriophages lysogenic and lytic cycles, R Plasmids were explained.

### **MBH-202: MOLECULAR BIOLOGY**

CO1	Students attained knowledge about Molecular biology Concepts, DNA damage and repair, DNA replication.
CO2	Transcription, translation and gene expression regulators these concepts were well explained.
CO3	Control of Gene expression at transcription and translation level were learnt by students

### **MBH-203: ENVIRONMENTAL MICROBIOLOGY**

CO1	Students acquired knowledge on Aerobiology, principles of sedimentation, transmission of airborne diseases and the diagnosis of allergies.
CO2	Fresh and marine ecosystems were studied in detail. Knowledge on management of waste water treatment was attained by students.
CO3	Concepts on Abiotic and biotic interactions of soil and microbes well explained. Biogeo chemical cycles were explained in detail.
CO4	Obtained knowledge on Microbial transformations of Carbon, Sulphur, and Mercury.
CO5	Mechanisms and adaptation of extremophiles were well understood by students.
CO6	Role of microbes in degradation, Bioremediation of soil, air and water and their advantages were learnt by students.

### **MBH-204: FOOD MICROBIOLOGY**

CO1	Students acquired knowledge on scope of food microbiology, extrinsic and intrinsic factors and their source
CO2	Obtained knowledge on food spoilage, conventional and modern methods for detection of spoilage.
CO3	Attained knowledge on food – borne infections and intoxication.
CO4	Developed knowledge on principles and methods of food preservations.
CO5	Attained knowledge on fermented foods.
CO6	Food and sanitization methods were well explained to the students

### MBH 301: MEDICAL MICROBIOLOGY

CO1	Comprehensive information and insights in medical microbiology, Normal microbial flora of human body and infection process routes of transmission of microbes in the body. Description and pathology of diseases.
CO2	Will have a specific focus on Description and pathology of diseases.
CO3	Will also provide conceptual knowledge and significance of Laboratory diagnosis of Common infective syndromes and parasitic manifestations, Methods of transmission and role of vectors-biology of vectors genetically modified microbes.
CO4	Obtain knowledge on Problems of drug resistance and drug sensitivity in bacteria.
CO5	Acquire the knowledge of Viral diseases, Interferon and types of inducers.

### MBH 302: RECOMBINANT DNA TECHNOLOGY

CO1	Major events in the development of rDNA technology. Introduction of rDNA into bacterial cells. Selection of transformants and recombinants – lac selection.
CO2	Learning tools and techniques in rDNA technology- DNA manipulative enzymes.
CO3	Acquire skills on techniques of construction of recombinant DNA - Cloning vectors and isolation of gene of interest.
CO4	Construction of genomic DNA library and cDNA library. Methods for selection of recombinants and analysis of cloned genes by sequencing methods. Expression of recombinant protein in <i>E. coli</i> and eukaryotes.
CO5	Identify problems associated with production of recombinant proteins and protein purification and devising strategies to overcome problem.
CO6	Learning various application of rDNA technology in evolving plants for resistance to pest and disease, tolerance to herbicides and abiotic factors. Learning techniques for production of pharmaceuticals, growth hormones, vaccines, gene therapy in expression system.

### MBH 303: IMMUNOLOGY

CO1	To promote critical, provide with a foundation in immunological processes, knowledge on how the immune system works building on their previous knowledge from biochemistry, genetics, cell biology and microbiology.
CO2	Be able to clearly state the role of the immune system, compare and contrast the innate versus adaptive immune systems. Be able to articulate the roles of innate recognition receptors (i.e. Toll-Like Receptors) in immune response, be able to compare and contrast humoral versus cell-mediated immune responses.
CO3	Be able to distinguish various cell types involved in immune responses and associated functions, be able to distinguish and characterize CD4+ T helper cell lineages Th1, Th2, Th17, and regulatory T cell (Treg)
CO4	Be able to distinguish and characterize antibody isotypes, development, and functions, understand the role of cytokines in immunity and immune cell activation and be able to identify and characterize cytokines of particular immune importance.
CO5	Understand the significance the Major Histocompatibility Complex in terms of immune response and transplantation, be able to describe lymphocyte development and the expression of their receptors; and be able to provide an overview of the interaction between the immune system and pathogens.



### **MBH 401: AGRICULTURAL MICROBIOLOGY**

CO1	Students will learn about microbes and soil fertility, decomposition of organic matter by microorganisms, biological nitrogen fixation, genetic engineering, plant microbe interaction.
CO2	Rhizosphere microorganisms, siderophores , VAM, bioinoculants, biofertilizers, biopesticides, molecular plant pathology, molecular mechanism of disease establishment.
CO3	Plant diseases fungi, bacterial, mycoplasmal, viral, protozoa, viroids, parasitic plant diseases, post harvest diseases and control measures and integrated pest management in detail.
CO4	The paper dealt on the microbes and their interaction with soil and inorganic molecules. The microbes involved in soil fertility, fixation of inorganic molecules into organic absorbable form.
CO5	Bioinoculants involved as beneficial in nature. Molecular plant pathology and the plant diseases involved in the pathogenic cycle.

### **MBH 402: INDUSTRIAL MICROBIOLOGY**

CO1	The paper concentrated on the microbes important in the industrial process. The fermentation reactions and the Fermentors involved in the production.
CO2	The scope of industrial microbiology, industrially important microorganisms and their preservation, strain improvement, maintenance and containment of recombinant organisms.
CO3	Different types of Fermentors – Solid state fermentation. Down streaming process for the separation of the product. Batch culture, continuous culture growth kinetics, physical and chemical parameters required for microbial growth, cell number, direct and indirect methods, Newtonian and Non-Newtonian fluid, plastic fluids, viscosities and anti—foam agents.
CO4	The study also dealt with Intellectual property rights and the Entrepreneurship. The patent, copyrights, trademarks, trade secret, geographical indications, Industrial designs.
CO5	Patent laws, Patenting of living organisms, procedure involved in patenting, patent infringement, patent filing and international patent law, PCT, provisional and complete specification, patentable and non-patentable materials, product planning and development, Trade related aspects (TRIPS), WTO, WIPO, international & regional, concept and theories of entrepreneurship, Entrepreneurial traits and motivation, Nature and importance of entrepreneurs.
CO6	Entrepreneurship in India, barriers in entrepreneurship, agreements, Valuation & business concerns. Government regulations for microbial products.

### **MBH 403: MICROBIAL BIOTECHNOLOGY**

CO1	The paper dealt with the microbial biotechnology and its production of industrial important of products.
CO2	Microbial products of commercial use, microbial enzymes, immobilization of cells and enzymes and their uses.
CO3	Microbial transformation and organic synthesis of the medicinal products. The microbial products for commercial use ,industrial production of organic acids, amino acids, solvents, antibiotics, microbial polysaccharides and polyesters
CO4	The microbial products for commercial use ,industrial production of hormones, anticholesterol compounds, vaccines, microbial insecticides, secondary metabolites, microbial enzymes, immobilized enzymes and cells
CO5	Nanotechnology, Bioethics and biosafety involved in the regulation of GM products.

## MSC BIOTECHNOLOGY

### BTH-101: CELL BIOLOGY

CO1	Emphasizes on Basic Characteristics of the Cell-Structure, organization and composition, Components of Blood and their functions, Extracellular matrix
CO2	To Understand the Cytoskeletal structures and their functionality
CO3	Helps acquire a comprehensive understanding of the Membrane transport in a cell
CO4	Focus on cell signaling, Cell-cell interaction, cell adhesion and cell junction
CO5	To study the Molecular events of cell division and cell cycle, regulation of cell cycle events- Cyclins, Cyclin dependent kinases, inhibitors. Apoptosis, necrosis.
CO6	Understanding the structure and functionality of specialized cells-Muscle and nerve cells
CO7	Knowing the Antioxidant defence system and Senescence

### BTH- 102: MOLECULAR GENETICS

CO1	To learn the physical basis of heredity
CO2	To Understand chromosomes and Genes (responsible for transmission of hereditary characters through generations), Karyotype analysis
CO3	Understanding of Genetic recombination and recombination in bacteria
CO4	Knowing the transposable genetic elements
CO5	Focus on Mutation, Sex determination and dosage compensation
CO6	To Study the Population genetics

### BTH-103: GENERAL MICROBIOLOGY

CO1	To Study Microbial classification
CO2	Understanding of Prokaryotic Microorganism- General properties, Structure, and Reproduction
CO3	Focus on Eukaryotic Microorganisms- General characters, Structure and Reproduction
CO4	To understand Viruses, Virioids and Prions (Acellular entities)
CO5	Knowing the Microbial Growth and Control
CO6	Learning of Microbiological methods

### BTH- 104: BIOCHEMISTRY

CO1	Provides knowledge about Principles of Bioenergetics
CO2	To understand Oxidative phosphorylation
CO3	Knowing of Carbohydrates Classification, structure, properties, function and metabolism
CO4	Focus on Amino acids and proteins
CO5	Deep understanding of Lipids Classification, structure, properties, function and metabolism
CO6	Covers Nucleic acids structure, properties and metabolism

**BTS-105: BIOSTATISTICS (Soft core)**

CO1	Understand various application area of biostatistics
CO2	Understand different types of data and sampling techniques
CO3	Students gain knowledge about Bio-statistics, basic concepts, data types, Properties of the data
CO4	Understand Probability, Statistical Inference, Statistical package
CO5	Identify appropriate tests to perform hypothesis testing and experimental design for biological experiment and interpret the output adequately.

**BTH-201: BIOCHEMICAL TECHNIQUES AND ENZYMOLOGY**

CO1	Students get hands on experience of using Physical Techniques & Chromatographic Techniques.
CO2	Students will learn principles and applications of PAGE and SDS PAGE agarose gel electrophoresis.
CO3	Will understanding nomenclature, classification, chemical nature and properties of enzymes. Types of enzyme specificity. Strategies of purification of enzymes. Enzyme models.
CO4	Students will learn in detail Enzyme Kinetics and Mechanism of Enzyme catalysis.
CO5	To understand structure and mechanism of action of some important co-enzymes like NAD <sup>+</sup> , FAD, FMN, TPP, pyridoxal phosphate, lipoic acid, CoASH and vitamin B12.

**BTH-202: MOLECULAR BIOLOGY**

CO1	To understand the Structure and functions of different types of RNA.
CO2	To rigorously study Biochemical evidences for DNA as genetic material. Watson and Crick model of DNA, different forms of DNA.
CO3	Understand the mechanism of DNA replication and repair and Identify the significance of techniques used to study them.
CO4	Students will learn to correlate the mechanism of prokaryotic and eukaryotic transcription process and appraise the different types of RNA processing methods.
CO5	Students will understand to explore the mechanism of prokaryotic and eukaryotic translation and differentiate various types of gene expression regulation.

**BTH-203: IMMUNOLOGY AND IMMUNOTECHNOLOGY**

CO1	To develop the basic knowledge of Innate and acquired immunity, structure and functions of immune cells.
CO2	Students will learn to applying the knowledge of immunology in development of immuno-therapeutics and diagnostics.
CO3	To comprehensively understand the Structure and properties of antigens, antibodies. Generation of immunological diversity. Complement pathways and biological significance.

CO4	Understand Serum separation and serological reactions (a) agglutination (b) precipitation. Enzyme linked immunosorbant assay. Isolation of lymphocytes from peripheral blood
CO5	Understand the concept of structure and functions of MHC and HLA systems. Genetic control of immune response. Tissue transplantation.

#### BTH-204: ENVIRONMENTAL BIOTECHNOLOGY

CO1	Students will learn to assess the methods involved in isolation and screening of potential microorganisms for production of industrial bioproducts.
CO2	Understand and analyse the various metabolic pathways involved in biosynthesis of industrial products.
CO3	Students will understand how to apply the metabolic pathway engineering principles in improvement of primary metabolites production.
CO4	Understand to apply the principles of waste management to treat the effluents from bioprocess industries
CO5	To learn how to choose and manage appropriate metabolic pathway mechanism for secondary metabolite production.

#### BTS-205 BIOINFORMATICS

CO1	To develop the basic knowledge Computer Network and Programming Languages.
CO2	Students will learn to use bioinformatics tools and software to analyze DNA and protein sequence.
CO3	Understand to applying the database management system concept in manage the biological data
CO4	Get hands on experience of using online tools to analyze genome sequences.
CO5	Students will be able to write computer programs in various programming techniques to analyze bioinformatics data.

#### **BTH 301 Plant and Agricultural Biotechnology**

CO1	Students will learn various aspects of Plant tissue culture
CO2	To understand the plant transformation techniques
CO3	Students will understand the applications of antisense RNA technology
CO4	To understand the production of industrially important enzymes produced by plants
CO5	To gain a detailed knowledge about GM crops

### **BTH 302 Animal Biotechnology**

CO1	To understand the basics of animal cell culture
CO2	Students will learn the various gene transfer techniques used for production of transgenic animals
CO3	Students will understand the both technical and ethical problems related to animal biotechnology
CO4	Students will comprehensively learn the good manufacturing and laboratory practices while handling animals
CO5	Students will learn about the detailed applications of animal biotechnology

### **BTH303 Genetic engineering**

CO1	To comprehend various tools and techniques used in genetic engineering
CO2	Students will learn scientific methodologies used in gene modification
CO3	To understand applications of genetic engineering in biological research
CO4	Students will get detailed knowledge of methods of gene transfer
CO5	Students will comprehend different cloning strategies

### **BTO 304 Applied Biotechnology**

CO1	Students will develop the strategic leadership and decision-making skills necessary in biotechnology
CO2	To appraise the current regulatory, quality control, and legal frameworks that impact biotechnology
CO3	Students will learn professional and scientific communication appropriate for biotechnology
CO4	Students will understand the basics and applications of biotechnology in different subjects
CO5	Students will comprehend the different methodologies and their application in biotechnology

### **BTP 305 Plant, Agricultural and Animal Biotechnology**

CO1	Students will gain practical knowledge of plant tissue culture
CO2	Students will learn methods involved in plant genomic DNA isolation
CO3	Students will analyse the cell cytotoxicity and cell viability assays using animal cell lines
CO4	Students will understand the methods used for in vitro culture of animal cells
CO5	Students will learn mushroom culture techniques

### **BTP306 Genetic Engineering and Bioinformatics**

CO1	Students will be able to perform basic genetic engineering experiments
CO2	Students can gain technical knowledge of DNA isolation, gene identification etc
CO3	Students will be able to perform different electrophoresis techniques in laboratory
CO4	Students will comprehend the concept and be able to apply the methods at biotechnology industries
CO5	Students will be able to perform and interpret the results of genetic engineering experiments

### **BTH-401: BIOPROCESS ENGINEERING**

CO1	To comprehend the state of art of bioreactors, understand the need of bioreactors in various fields, learn the different product specific fermentation processes.
CO2	Understand and analyse the problem of selection of suitable bioreactor configuration. Understand and specify reactors used in industrial bioprocesses.
CO3	To understand and study the fermentation processes, kinetics and various parameters used to control the fermentation process.
CO4	To assimilate the different bioprocess techniques in downstream processing and to learn the production process of industrially important products.
CO5	To learn the different regulations related to the production of different bioprocess products. Understand the IPRs related to products of Biotechnology. Learn the requirements and needs for entrepreneurship.

### **BTH-402 MEDICAL BIOTECHNOLOGY**

CO1	To understand the different modes of infection, symptoms, epidemiology and control of different microbial diseases in humans. To extensively study cancer, its biology and latest breakthroughs in cancer therapy.
CO2	To rigorously study human diseases, understand the biology and functions of different organs in the body.
CO3	Understanding the need of nanobiotechnology, drug delivery techniques and molecular therapeutics for the designing of drugs.
CO4	To analyse the drug development process, the requirements and approaches to find a potential drug.
CO5	To comprehensively learn the various regulatory bodies in clinical research, understand the process of clinical trials and the ethical issues raised in clinical research.

### **BTH-403 GENOMICS AND PROTEOMICS**

CO1	To develop the basic knowledge of omics and their application in research.
CO2	Understand genome sequences, their organization and its structure. To understand the approaches in mapping and study the organisation of different genomes.
CO3	To comprehensively understand the functions of genomes and to study comparative genomics.
CO4	To analyse the needs of proteomics, various techniques and tools used in the study of proteomics.
CO5	Understand the concept of metabolomics, methods of analysing metabolites and its regulation.

**DEPARTMENT OF BIOCHEMISTRY**  
**MSc BIOCHEMISTRY SEMESTER – I**  
**COURSE OUTCOME (THEORY & PRACTICAL)**

**Biophysical and Bio – organic chemistry**

CO1	Discuss fundamentals of biomaterials with emphasis on classification, chemistry and characteristics
CO2	Elaborate the methods of stereochemistry, and thermodynamics law
CO3	Analyze the mechanism of Bio-organic reactions
CO4	Gain an understanding the basic elements and fundamentals of biochemistry
CO5	Discuss fundamentals of biomaterials with emphasis on classification, chemistry and characteristics

**Biomolecules**

CO1	Easily understand the basic concepts/functions of solutes, chemical bonding and organic compounds. Describe the classification of biomolecules
CO2	Describe the basic reaction types and mechanisms of bio molecules. Understand the structures and functions of biomolecules
CO3	Analyse and study the chemical and biochemical properties of bio molecules
CO4	Understand relationships between biological molecules and human health. Identify biomolecules structural differences and its properties
CO5	Gain an understanding the basic principle of chemistry as well as biology. Understand the scope of biological chemistry Easily understand the interrelationship of organic compounds and homeostasis in biological organisms

**Analytical Biochemistry**

CO1	Demonstrate broad knowledge in modern analytical instrumentation with deep knowledge in its core concepts and its applications. Acquire knowledge about the cell culture techniques, and Various extraction methods.
CO2	Understand the principle, Instrumentation of different types of Light microscopy, electron microscopy Fluorescence microscope, fluorescence recovery after photo bleaching (FRAP), Fluorescence resonance energy transfer (FRET), and its applications in various fields of research.
CO3	Acquire knowledge about the basics and latest developments in the instrumentation techniques of Centrifugation, flow cytometry, filtration, dialysis and their applications in various research fields.
CO4	Demonstrate skill to explain about principle, BioCalorimetry and Radioactivity principles, measurement method and its biological applications.
CO5	Study applications of statistical tools like Mean, Median, Mode, Standard deviation, Standard error, 't' test and ANOVA in biological research.

### General Physiology

CO1	Understand the inter relationships within and between anatomical and physiological systems of the human body
CO2	Describe the structure of major human organs and explain their role in the maintenance of healthy individuals. Understand the role of Membranes and its transport mechanism
CO3	Know in detail about the 4 levels of biological tissues. Describe the general function of each organ system.
CO4	Explain how the activities of organs are integrated for maximum efficiency. Have in-depth understanding of anatomy and physiology of respiratory, digestive, and vascular system
CO5	Have in-depth understanding of anatomy and physiology of muscle physiology

### Nutrition

CO1	Acquire knowledge about the Basic nutrient elements like carbohydrate, Protein, Lipids, Macro, micro and trace elements.
CO2	Understand the inter relationships within and between the nutrient element with macro and micro molecules.

### (PRACTICAL PAPERS) OUTCOME

#### Gen. Biochemistry – I

CO1	The students will learn to perform the calibration of buffer, Saponification, acid value, peroxide value, iodine number
CO2	The students will learn to find out to isolate the components (casein, starch and glycogen) from the sample source.

#### Gen. Biochemistry –II

CO1	The students will learn to estimation of reducing sugars
CO2	The students will learn to estimation of protein, inorganic phosphates
CO3	The students will learn the method of Isolate different amino acids and nucleic acid.

## II-SEMESTER

### Enzymology

CO1	Distinguish the fundamentals of enzyme properties, nomenclatures, characteristics and mechanisms. Apply biochemical calculation for enzyme kinetics.
CO2	Discuss the factors affecting enzymatic reactions. Describe the concepts of co-operative behaviour, enzyme inhibition and allosteric regulation.
CO3	Compare methods for production, purification, characterization and immobilization of enzymes.
CO4	Describe the major applications of enzymes in industry, understand the principles of enzyme immobilisation techniques and enzyme extraction procedures.
CO5	Discuss various application of enzymes that can benefit human life
CO 6	Discover the current and future trends of applying enzyme technology for the commercialization purpose of biotechnological products.



## Analytical Biochemistry II

CO1	Demonstrate broad knowledge in modern analytical instrumentation with deep knowledge in its core concepts and its applications
CO2	Acquire knowledge about the basics and latest developments in the techniques of Chromatography, Electrophoresis (IEF, 2D PAGE) and immuno Electrophoresis and their applications in various research fields
CO3	Demonstrate skill to explain about principle, and applications of latest spectroscopy techniques like CD, LD, IR , NMR, ESR and Mass spectroscopy.
CO4	Gain the knowledge in the current trends of proteonomic and Bioinformatics
CO5	Learn about primary and secondary databases of nucleic acids and proteins(Swissport, FASTA, Pubmed, Medline & NCBI)

## Metabolism – I

CO1	Discuss the overall concept of cellular metabolism – anabolic and catabolic pathways, energy storage and release, production of building blocks for macromolecule synthesis
CO2	Differentiate how various organs control metabolism.
CO3	Explain glucose homeostasis (pathways and hormonal regulation). Discuss Krebs cycle, electron transport, and the pentose phosphate pathway
CO4	Develop a basic understanding of biochemical events associated with structural arrangement of plant cell and organization.
CO5	Explain and understand the biochemistry of photosynthetic process and mechanism of Nitrogen fixation

## Membrane Biochemistry

CO1	Describe the origin of life, from the abiotic world to multicellular organisms, including an account of endosymbiosis
CO2	Explain the structure, properties and functions of various classes of macromolecules in cells
CO3	Describe the intricate relationship between various cellular organelles and their functions
CO4	Enumerate the structure and functions of the plasma membrane
CO5	Explain membrane physiology to include transport mechanisms, membrane potentials and action potentials

## Microbiology

CO1	Demonstrate various classes and structure of microbes. Applications of microbes in food industry and pharma industry
CO2	Discuss preparation and applications of products from industries. Role of microbes in nitrogen fixation, purification of water
CO3	Learn and understand the basics of mycology and Production of mutants and their characterization
CO4	Learn about Bacterial toxins, and mode of action of bacterial protein toxins. Host Microbe Interactions, Viruses of bacteria, plant and animal cells, Mycoplasma and virioids

## (PRACTICAL PAPERS) COURSE OUTCOME

### Biochemical and Immunochemical Techniques

CO1	Learn how to standardize various biomolecules
CO2	Separate carbohydrates and amino acids by paper, TLC and column chromatography
CO3	Separate compound by electrophoresis
CO4	Practically learn and understand the antigen-antibody interaction by Double Immunodiffusion method, Ouchterlony's Method, Immunoelectrophoresis, Western Blotting and ELISA

### Enzymology

CO1	Perform assay of clinically important enzyme: serum alkaline phosphatase, serum creatine phosphokinase and serum acid phosphatase, and the factors affecting enzyme activity and determination of $K_m$ .
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## III-SEMESTER

### Molecular Biology-I

CO1	Acquire knowledge about nucleic acid as genetic information carriers, Possible modes of replication, and roles of helicase, primase, gyrase, topoisomerase, DNA Polymerase, DNA ligase, and Regulation of replication
CO2	Understand the detailed mechanism and regulation of Eukaryotic DNA replication, along with Mitochondrial and chloroplast DNA Replication
CO3	learn about mechanism and regulation of transcription in prokaryotes along with Reverse transcription
CO4	Understand the classes of DNA sequences, Genome-wide and Tandem repeats, Retroelements, Transposable elements, Centromeres, Telomeres, Satellite DNA, Minisatellites, Microsatellites; applications of satellite DNA and Split genes

### Molecular Physiology

CO1	learn about structural organization of Cell, transport across cell membrane, exocytosis, receptor mediated endocytosis, protein trafficking in cells, Protein sorting, vesicular Transport and protein targeting
CO2	learn about cell division: mitosis and meiosis; Cell cycle: check points, role of cyclin and cyclin dependent kinases in cell cycle regulation
CO3	Learn about primary and secondary messenger and signalling pathway
CO4	learn about Cancer - Causes, types, diagnosis, signaling pathways and its mechanism of action
CO5	Learn about Plant hormones and its mechanism of action

## Metabolism – II

CO1	learn amino acid metabolism and its association with cellular energy production
CO2	learn Lipid biosynthesis, Degradation of fatty acids and cholesterol, ketone bodies, acidosis, ketosis
CO3	learn and understand about the Biosynthesis of purines and pyrimidine nucleotides, degradation of nucleotides, salvage pathways

## Plant physiology

CO1	Understand the structure, biosynthesis and mechanism of action of major plant hormones, plant growth regulators, and photoreceptors in higher plants
CO2	learn about the secondary plant metabolism, biosynthesis and function of major secondary plant product classes like terpenoids, alkaloids and flavonoids etc.
CO3	learn about nitrogen metabolism, mechanism of nitrate and nitrite reduction, and fixation of nitrogen
CO4	Gain knowledge electron transport in higher plants and its relation with the carbon fixation pathways, Light regulation of photosynthetic enzymes, Calvin cycle, CAM, C4 pathways, and photorespiration

## Cyber space- Open Elective

CO1	Learn basic components of information technology
CO2	Understand the interface of the components, roles and their difference
CO3	Study the back end of the system in database security issues
CO4	Grasp the knowledge in networking components with its architecture and protocols
CO5	Know the standards for security in the cloud environment

## (PRACTICAL PAPERS) COURSE OUTCOME

### Clinical Biochemistry

CO1	Gain knowledge of biological samples and their collection procedures
CO2	Perform biochemical laboratory analysis in blood and urine samples and interpret the generated results after analysis in order to determine the likely diagnosis
CO3	Assess presence and absence of normal and abnormal constituents in urine by performing qualitative urine analysis
CO4	Determine activity of enzymes such as creatine kinase, LDH, SGOT and SGPT
CO5	Determine blood urea, uric acid and creatinine which acts as renal indices
CO6	Analyze serum for Glucose, cholesterol, Bilirubin and A/G ratio

### Molecular Biology

CO1	Understand the basic principle involved in isolation of biomolecules from various biological sources
CO2	Isolate DNA from various sources – viz plant, microbes and animals
CO3	Purify DNA, RNA, Separate DNA, RNA, Separating Proteins by SDS PAGE
CO4	Understanding the mobility differences of macromolecules in electrophoresis
CO5	Able to handle RT- PCR

## IV-SEMESTER

### Molecular Biology-II

CO1	Understand the synthesis of DNA and Post replication processes
CO2	Understand the synthesis of RNA and post transcriptional modifications
CO3	Understand the synthesis of protein and its post translational modification
CO4	Describe the molecular mechanisms behind DNA damage and repair
CO5	Describe and compare different molecular mechanisms to bring about cell death and explain how this is linked to DNA damage
CO6	Explain how molecular defects in a cell can lead to its development into a cancer cell

### Biochemical Genetics

CO1	learn and understand the Genome organization, Cytogenetics, Genetic Control of Development
CO2	Understand the basics of heredity population genetics and master fundamental genetic calculation
CO3	learn and understand the Principles of Mendelian inheritance, Linkage and genetic mapping; Extrachromosomal inheritance, Sexlinked inheritance and genetic disorders, Somatic cell genetics, Population genetics
CO4	learn and understand the Human Genome Project, Gene therapy, Genetic Testing, and Genetic Counseling

### Biotechnology

CO1	Explain the general principles of generating transgenic plants, animals and microbes
CO2	learn about the basic concept of Plant Biotechnology and applications in agriculture like micro-propagation, haploid plants, embryo culture, hybrids, cybrids etc
CO3	Understand the role of vectors, plasmids in gene technology
CO4	Understand the gene transfer methods
CO5	Understand the DNA sequencing methods

### Immunology and Toxicology

CO1	Learn the classification of immunity, cell mediated immune response, humoral immune response
CO2	Gain the knowledge of structure, types of antigens and antibodies
CO3	Elaborate the method of monoclonal antibodies synthesize and various theories adopted for production of antibody.
CO4	Learn about the different types of vaccines synthesized and applications
CO5	Explore knowledge on autoimmune disorder, hypersensitivity and its types
CO6	Understand the basic concepts of pharmacy - ED50, LD 50 and drug metabolism

## (PRACTICAL PAPERS) COURSE OUTCOME

### Genetic Engineering and Protein Chemistry

CO1	practically learn to isolate plasmid DNA and genomic DNA from <i>E. coli</i> and will learn to perform Agarose gel electrophoresis of DNA
CO2	learn Restriction digestion of DNA and its application in cloning and to perform PCR
CO3	learn and understand the Blotting technique
CO4	Learn Enzyme isolation, purification and determination of its activity

### Project Work

CO1	To develop synopsis of a defined research problem
CO2	To conduct the bench work
CO3	To prepare the research report and its oral demonstrations.

## PG DEPARTMENT – MBA

### Program outcome

PO1	To equip the students with required tools and techniques for improving their decision making skills and inventive thinking.
PO2	Students will gain the skills required to navigate through the complexities of managing data, to identify financial challenges, innovation ideas, addressing the challenges of organizational management and aware of alternative to jobs.
PO3	Students of the management program are trained for changing environment in a social and global context and practical approach to problem solving and function effectively as skilled managers.
PO4	Students get prepared to work in multicultural and multidisciplinary teams for effective problem solving and understand the principles of group dynamics, team work and growth of management profession.

### Program specific outcome

PO1	To develop and apply fundamental management skills through practical knowledge for supporting business and management decisions through multidisciplinary techniques
PO2	To develop and nourish leadership skills, team building and team player qualities to accomplish organizational goals
PO3	Cultivating and promoting entrepreneurial skills with ethics, social and environmental commitment for sustainable business practices in micro and macro business atmosphere.

### COURSE OUTCOME - I MBA

#### Economics for managers

CO1	Introduction to managerial economics and various economic theories and principles
CO2	Understanding of demand analysis and consumer behavior
CO3	Insight to theory of production and analysis of cost
CO4	Determination of price and output
CO5	Factor market and factor pricing
CO6	Macroeconomic analysis and policy

#### Organizational behavior

CO1	Introduction to organization behavior meaning, benefits and ob. as an inter-disciplinary subject
CO2	Learning about personality, learning process, attitude and values
CO3	Understanding motivation, theories of motivation, team building & group dynamics, leadership theories
CO4	Study of conflict and its types
CO5	Study of culture, discipline and organizational effectiveness
CO6	Study of change and organizational development

### Accounting for managers

CO1	Conceptual basis for accounts, fraud and ethical issues in accounting
CO2	Orientation to financial statements, accounting concepts and conventional and gap
CO3	Measuring and reporting assets, liabilities and equity
CO4	Analyzing and interpreting financial statements
CO5	Orientation to cost accounting
CO6	Insight to contemporary issues in accounting

### Statistics for management

CO1	Role and applications of statistics in managerial decision
CO2	Time series analysis, concept, additive and multiplicative models
CO3	Concept of probability and its uses in business decision - making
CO4	Introduction to sampling distributions, sampling distribution of mean and proportion
CO5	Estimation theory and hypothesis testing
CO6	Chi-square test for single sample standard deviation and decision theory

### Marketing for customer value

CO1	Essentials of marketing, importance and core marketing concepts
CO2	Creating/choosing customer value, satisfaction and loyalty
CO3	Designing customer value through products and pricing strategies
CO4	Delivering customer value, market logistics, supply chain management
CO5	Communicating customer value through mass communication and digital platform
CO6	Sustaining growth and customer value, managing holistic marketing organization

### Business and industry

CO1	An overview of Indian economy, performance and recent trends
CO2	Study of essentials of business & industry
CO3	Evolution of business & industry in India from British raj, swadeshi movement, post-independence, license raj and lpg era
CO4	Structure and status of business & industry in India
CO5	Growth of business & industry
CO6	Interface with voluntary organizations

### Communication skills

CO1	Communication in business and its forms
CO2	Oral communication skills through telephonic, video and Skype, group discussion
CO3	Written communication skills through commercial letters, e-mail messages, job applications & resume writing
CO4	Listening skills, active and empathic listening, listening and judgment
CO5	Interpersonal communication skills, conditions of negotiating, types and sources of conflicts

### COURSE OUTCOME - II MBA

#### Technology for management

CO1	Study on introduction of a computer system, overview and types network topologies, computer security
CO2	Insight to conceptual and detailed designs of MIS
CO3	Information system analysis, design, system testing, hard ware, software and documentation & its tools
CO4	Information on system implementation strategies and process
CO5	Working of e-commerce and ERP systems
CO6	Introduction to OS and office software and internet protocol

#### Managerial research methods

CO1	Introduction to learning of management research, types, purpose and process
CO2	Identification of research problem, research hypothesis and research design
CO3	Data collection and measurement concepts like questionnaire design, pilot test , primary & secondary data
CO4	Understanding the concept of sample data preparation
CO5	Data analysis and procedure for testing of hypothesis
CO6	Research report writing, types and structure

#### Entrepreneurship and ethics

CO1	Study of entrepreneurship in the new millennium and entrepreneurship role in economic development
CO2	Opportunity assessment , sources of finance for new venture and reasons for venture failure
CO3	Learning of feasibility analysis and crafting business plan
CO4	Introduction to legal forms of entrepreneurial organizations, legal environment
CO5	Introduction , perspective of social entrepreneurship with few experiments
CO6	Insight to business ethics, CSR, environmental awareness and ethical leadership by entrepreneurs



### Human capital management

CO1	To enlighten the students on the principles and practices of HR as a capital factor
CO2	Insight on human capital planning and employee hiring
CO3	Study on HR development & contemporary HRD practices
CO4	Introduction to performance management system and appraisals
CO5	Compensation management and employee relations, trade union and their relevance
CO6	Study of strategic HRM and business performance

### Financial management

CO1	To provide the concepts and foundations of managing finance in business enterprises
CO2	Equipping students with time value of money concepts
CO3	Long term financing decisions, leverages types and measurement
CO4	Long term investment decisions and its methods
CO5	Insight to short term financing and investment decisions
CO6	Study of dividend decisions and its types

### Quantitative techniques and operation research

CO1	To impart knowledge in concepts and tools of or and QT
CO2	Study of importance of transportation, terminologies, methods like NWCM, LCM & VAM to find feasible solution
CO3	Insight to assignment, importance of its problems, sequencing - terminologies and notations
CO4	Understanding the network analysis of pert and CPM techniques
CO5	Theory of games and description of queuing models
CO6	Exposure to simulation models like monte carlo using random numbers and replacement models

### Innovation management

CO1	To impart skills of innovation and enable students to think and act on innovation
CO2	Application of innovation and its techniques
CO3	Marketing of innovation products and strategic considerations on innovations
CO4	Understanding of evaluation of innovation and its legal aspects
CO5	Insight about innovation in reality and innovation for problem solving

## COURSE OUTCOME

### Master of Commerce

#### I SEMESTER

##### MONETARY SYSTEMS

CO 1	Understanding monetary system of an economy intended to provide knowledge on: Various financial institutions- financial and capital markets , Money- volume of supply-significance, Methods of note issue ,Theories of money
CO 2	The learner obtains knowledge on how money supply cause inflation or impact of money supply on price level and acquires knowledge on factor pricing, control on volume of money supply, understanding role of financial institutions in business credit.

##### INTERNATIONAL BUSINESS ENVIRONMENT

CO 1	Apply the basic concepts, models, approaches and theories of international business in today's global environment.
CO 2	Measure significant pros and cons of globalization and roles of MNCs in the global business environment.
CO 3	Identify forms of financing and their implications in foreign trade.
CO 4	Assess the functional areas of business organization in international business environment.
CO 5	Determine the functional structure of the international bodies in facilitating economic integration and EXIM trade

##### PRINCIPLES AND PRACTICES OF BUSINESS DECISIONS

CO 1	To comprehend the basic characteristics of economic development and economic growth.
CO 2	Understand the sources of public finance, Attain the advantages and knowledge of public investments and other government expenditures, Understand the needs of public borrowing
CO 3	Understand supply and demand and the basic forces that determine equilibrium in a market economy
CO 4	Understand the concept of Production and Production Function, he meaning of Factors of Production, Short Run and Long Run
CO 5	Understand the framework that supports a set of pricing strategies

##### INFORMATION TECHNOLOGY FOR BUSINESS

CO 1	Explain the fundamental framework of information system and its application in organizations.
CO 2	Apply information system solutions in business operations. 3. Compile hardware software and network service of an enterprises.
CO 3	Develop database concepts and database management system software.
CO 4	Create business applications of data mining and warehousing to the decision-support level of organizations.

## MANAGERIAL FINANCE

CO 1	Demonstrate the functions of finance and capital structure theories.
CO 2	Assess the concept of risk in capital budgeting decisions.
CO 3	Evaluate the dividend policy for corporate dividend decision.
CO 4	Design corporate restructuring under merger and acquisition.

## GLOBAL TALENT MANAGEMENT

CO 1	Develop an understanding of the concept of human resource management and its relevance in organizations.
CO 2	Relate the principles and practices to staffing, job analysis, training, recruitment and selection, performance appraisal, compensation, and compliance with human resource requirements.
CO 3	Elaborate the areas of concern in employee welfare, health, safety, and industrial relations.
CO 4	Discuss the need for HR evaluation and ethical issues in HRM functions.
CO 5	Explain broad range of issues and challenges faced by MNCs in their IHRM activities.

## CORPORATE COMMUNICATION SKILLS

CO 1	Recall communication theories and assess their relationship to Corporate Communication practices. Measure the value and efficacy of interpersonal communication skills in various business operations.
CO 2	Analyse the importance of communication functions including media, community, employee, government, customer and investor relations.
CO 3	Utilize applications of Social Media platforms in business communications.
CO 4	Assess the relevance of listening skills in effective communication.
CO 5	Measure the value and efficacy of interpersonal communication skills in various business operations

## II SEMESTER

### MODERN INDIAN BANKING

CO 1	To familiarize the students about the role of monetary and credit policy
CO 2	To make them well acquainted with IRAC norms and securitization act
CO 3	To understand BASEL II and III norms
CO 4	To learn about innovations in the new era. To make them understand about prudential norms, the different banking institutions

### RISK MANAGEMENT AND DERIVATIVES

CO 1	Understand the concept of various derivative products such as futures, options, and swaps
CO 2	To apply hedging models in assessing price risk of derivatives
CO 3	To analyse and estimate value at risk for various derivatives
CO 4	To comprehend various derivative products and their performance in Indian and Global Markets

### ADVANCED RESEARCH METHODOLOGY

CO 1	Apply the basic concepts, principles and techniques of scientific methodology in business research.
CO 2	Formulate research schema for business research and identify the application of measurement and scaling techniques in business research.
CO 3	Build analytical skills to apply various statistical tools for testing, analysing and interpreting the survey data
CO 4	Select appropriate parametric and non-parametric tests for testing the research hypotheses and analysing the sample data.
CO 5	Compile the art of drafting and writing the research report.

### DIGITAL MARKETING

CO 1	Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks
CO 2	Articulate the value of integrated marketing campaigns across SEO, Paid Search, Social, Mobile, Email, Display Media, Marketing Analytics
CO 3	Recognize Key Performance Indicators tied to any digital marketing program.

### EMERGING TRENDS IN ENTREPRENEURSHIP

CO 1	Discover the dynamics of the entrepreneurial world and the role of government in encouraging entrepreneurs
CO 2	Identify and discuss the potential of small scale industries in the development of the economy
CO 3	Analyse the business environment in order to identify business opportunities
CO 4	Design viable business plan considering the various aspects of feasibility and discuss common pitfalls

## INDIAN ETHOS AND LEADERSHIP

CO 1	Understand the Indian ethos and its application in managerial practices
CO 2	Understand the importance of work ethos, values and its impact on stake holders
CO 3	Concept and Significance of leadership and communication skills in business
CO 4	Understand stress management techniques and its importance

## ARTIFICIAL AND BUSINESS INTELLIGENCE

CO 1	Understand Artificial Intelligence based applications to enhance business process.
CO 2	Understand and describe the fundamentals of business intelligence
CO 3	Implement the process of business intelligence to make better business decisions

### III SEMESTER

#### INTELLECTUAL PROPERTY RIGHTS

CO 1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP
CO 2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
CO 3	Identify activities and constitute IP infringements and the remedies available to the IP owner and describe the precautions steps to be taken to prevent infringement of proprietary rights in products and technology development.

#### LOGISTICS AND SUPPLY CHAIN MANAGEMENT

CO 1	Acquire the basic knowledge of logistics and supply chain management.
CO 2	Interpret the various technologies used in logistics and supply chain management.
CO 3	Explain the sectors associated with logistics and supply chain management.
CO 4	Interpret the procurement and different structure of procurement

#### CORPORATE REPORTING AND PRACTICES

CO 1	Apply the international accounting standards and Indian accounting standards in the preparation of financial statements of a company.
CO 2	Illustrate the new accounting standards and treatment for reporting the financial performance of business combinations.
CO 3	Compile the consolidated financial statements and income statements of a group and its subsidiaries.
CO 4	Discuss the new accounting treatment for industry based standards.

#### STRATEGIC COST MANAGEMENT

CO 1	Familiarize with the various pricing strategies in decision making. Explain the role of total quality management in improving the organisational performance.
CO 2	Describe some of the techniques and process of transfer pricing which are available to assist managers in taking decisions.
CO 3	Understand and application of the concept of learning curve
CO 4	Provide knowledge about balanced score card and bench marking.

#### CORPORATE TAX PLANNING

CO 1	To provide understanding of Direct Taxes including rules pertaining there to and their application to different business situations.
CO 2	Understand the procedure of assessment of company
CO 3	Tax planning and management in respect to amalgamation, mergers, and understand the concept of tax avoidance, evasion and double taxation, tax haven
CO 4	Corporate restructuring, issue of bonus shares, leasing, replacement and transfer pricing
CO 5	Exposure to tax payments through eTDS, eFiling of Tax returns and assessment, insight to CBDT settlement commission, refunds and revisions

## IV SEMESTER

### BUSINESS ANALYTICS

CO 1	Analyse the business data through various statistical techniques
CO 2	Communicate mathematical ideas effectively both in oral and written form
CO 3	Use a variety of visual models for representing the results of analysis
CO 4	Apply basic business analytics techniques to business problems

### FORENSIC ACCOUNTING AND AUDITING

CO 1	Examine the knowledge and skills required to perform forensic accounting services
CO 2	Evaluate issues relating to professional ethics and responsibilities in forensic accounting.
CO 3	Integrate knowledge of relevant legal principles, rules, and processes with forensic accounting practice
CO 4	Assess types of fraud activity and methods of fraud prevention, detection, and response, including bankruptcy fraud.
CO 5	Evaluate techniques used to prevent and detect fraudulent financial reporting.

### CORPORATE REPORTING PRACTICES- II

CO 1	To familiarise the students International financial reporting standards
CO 2	To study types of mergers, methods of accounting, Accounting for investment subsidiary
CO 3	To learn group financial statements/consolidated financial statement
CO 4	To study accounting for industry based standards

### STRATEGIC COST MANAGEMENT –II

CO 1	Evaluate the contexts in which management accounting operates within an organization and its link to the external environment.
CO 2	Compile management accounting techniques to draw reasoned conclusions.
CO 3	Summarize the different costs and pricing strategies for decision making purposes.
CO 4	Compute total cost using activity based costing and compare it with traditional costing method

### CUSTOMS DUTY AND GST

CO 1	Apply GST rules in taking managerial decisions in tax related matters..
CO 2	Assess GST using the concepts of time, place, and value of supply.
CO 3	Estimate input tax credit by using different provisions of the act.
CO 4	Outline the provisions concerned with payment of tax, interest, TDS, Refund and Returns
CO 5	Appraise the offenses and penalty governed by GST Law of India

## CO-PO ATTAINMENT

### Program outcomes (POs) and Program specific outcomes (PSOs) of MSc. Biotechnology

#### Program outcomes (POs):

**PO1: Knowledge:** Understand the basic knowledge and concepts of biotechnology and other interdisciplinary subjects.

**PO2: Skills:** Ability to apply their knowledge and perform experiments independently.

**PO3: Real time exposure:** Practical exposure to the basic and the advanced fields of Biotechnology.

**PO4: Advanced skills and research:** Gain practical knowledge about advanced subject in the area of nanobiotechnology, multi omics, immunotechnology, environment, animal, plant and agriculture biotechnology.

**PO5: Career and Employment:** Advancement of their professional career and employment in diverse areas of biotechnology.

#### Program specific outcomes (PSOs):

**PSO1:** To understand and analyze the basic concepts of cell biology, Genetics, Biochemistry, Molecular biology and bioinformatics.

**PSO2:** The program will impart Knowledge among students in the advanced fields of Biotechnology and its applications in various sectors.

**PSO3:** Apply the knowledge and skills to develop quality products and provide solution in the field of plant and agriculture biotechnology, Environmental Biotechnology, Nanobiotechnology, Industrial Biotechnology, and many other areas involved in biotechnology industries.

**PSO4:** Able to Perform experimental procedures and research independently in the areas of Biochemistry, Molecular biology, Plant tissue culture, Genetic Engineering, Molecular Ecology, Molecular marker Technology and Bioinformatics.

**PSO5:** Analyse the complex problems in different areas of Biotechnology and address the issues through use of modern tools and techniques in biotechnology.

#### Attainment of course outcomes (COs):

The course outcomes (COs) are defined for each course under the given program. The defined Cos are mapped to Pos and PSOs of the respective program. Assessment for course outcomes (COs) is carried out by each department for different programs regularly. The COs are mapped



against each question of the internal examination and CO analysis is carried out by faculty of each course. The contribution of COs is assessed by mapping them in term of low, moderate and high level, for the attainment of POs/PSOs. Data from all theory courses, practical courses and project courses were collected and are considered for course outcome (CO) attainment calculation. For each courses of post graduate except project course 30% weightage was given for internal assessment and 70% weightage was given for external assessment.

**Assessment methods for Theory, Practical and Project courses:**

<b>CO Attainment (Theory courses)</b>		
<b>Assessment methods</b>	<b>Weightage</b>	<b>Overall Weightage</b>
IA test1, IA test2, Assignment, seminar, attendance	30%	100%
Semester end theory examination	70%	

<b>CO Attainment (Practical courses)</b>		
<b>Assessment methods</b>	<b>Weightage</b>	<b>Overall Weightage</b>
Continuous assessment, model examination, Lab records, attendance	30%	100%
Semester end practical examination	70%	

<b>CO Attainment (Project courses)</b>		
<b>Assessment methods</b>	<b>Weightage</b>	<b>Overall Weightage</b>
Performance in project, Project Presentation, Publication	60%	100%
Viva Voce	40%	

**Theory Courses:**

Internal Assessment (30%): IA test1, IA test2, Assignment, seminar, attendance

External Assessment (70%): Semester end theory examination

**Practical courses:**

Internal Assessment (30%): continuous assessment, model examination, Lab records, attendance

External Assessment (70%): Semester end practical examination

**Project courses:** External Assessment: Performance in project, Project Presentation and Viva Voce

**Semester end theory examination:**

The examination is carried out by Bangalore University by the end of each semester. The exam is conducted for 100 marks with the duration of 3 hours. Evaluation is carried out at the valuation center set by the University by the qualified panel of examiners. The results are published online. The marks scored by the students are considered for calculation of CO attainment for each course.

**Semester end practical examination:**

For each practical course the examination is conducted for 4 hours. The examination includes performance, observation, viva voce, record submission. The marks are awarded by the external examiners allotted by the University. The final marks scored are considered for CO attainment for each course.

**Project course:**

Project course is allotted in the final semester of the program. Each student is given with a unique project topic. At the end of the project student needs to submit the report to the University for assessment. Students also need to present the entire work done before the external examiners allotted by the University. Marks are awarded based on the project performance, presentation and viva voce. The final marks are considered for overall CO attainment.

**The attainment levels are scored as below:**

Attainment level 1: 50% to 60 % students scoring greater than 60% marks

Attainment level 2: 60% to 70 % students scoring greater than 70% marks

Attainment level 1: 70% to 80 % students scoring greater than 80% marks

Course allotment	Course Title	Course Code
Theory	CELL BIOLOGY	BTH-101

**Course Outcomes (COs):**

1. Student is able to understand and apply the Knowledge of basic characteristics of the cell
2. Student is able to understand and apply the Knowledge of Cytoskeleton
3. Student is able to analyze and apply the Knowledge of Membrane Transport

4. Student is able to analyze and apply the Knowledge of Cell signaling
5. Student is able to understand and apply the Knowledge of cell cycle
6. Student is able to analyze and apply the Knowledge of Specialized Cells (Muscle & Nerve cells)
7. Student is able to understand, analyze and apply the Knowledge of Antioxidant defense system and Senescence

**CO PO Mapping:**

Slight (Low) = 1, Moderate (Medium) = 2, Substantial (High) = 3.

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	2	2	3	2
CO 2	3	2	3	3	3
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
CO 6	3	3	3	3	3
CO 7	3	2	3	3	3

**CO-PSO Mapping:**

Slight (Low) = 1, Moderate (Medium) = 2, Substantial (High) = 3.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	3	2
CO 2	3	3	3	3	2
CO 3	3	3	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
CO 6	3	3	3	3	3
CO 7	3	3	3	3	3

Course allotment	Course Title	Course Code
Theory	Environmental Biotechnology	BTH- 204

**Course Outcomes (COs):**

1. Student is able to understand and apply the Knowledge of environment and monitoring
2. Student is able to analyze and apply the Knowledge of water Management and waste water treatment
3. Student is able to analyze and apply the Knowledge of Biomining & Biodiesel
4. Student is able to analyze and apply the Knowledge of Bioremediation
5. Student is able to understand, analyze and apply the Knowledge of Biowaste treatment
6. Student is able to understand, analyze and apply the Knowledge of Global Environmental problems

**CO PO Mapping:**

Slight (Low) = 1, Moderate (Medium) = 2, Substantial (High) = 3 .

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	2	2	3	2
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
CO 6	3	3	3	3	3

**CO-PSO Mapping:**

Slight (Low) = 1, Moderate (Medium) = 2, Substantial (High) = 3.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	3	3	2	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
CO 6	3	3	3	3	3

Course allotment	Course Title	Course Code
Theory	Human Physiology	101

**Course Outcomes (COs):**

1. Student is able to understand and apply the Knowledge of basic tissues
2. Student is able to understand and apply the Knowledge of nervous system
3. Student is able to understand and apply the Knowledge of endocrine and Immune system
4. Student is able to understand and apply the Knowledge of Digestive, Cardiovascular, Respiratory and Excretory Systems
5. Student is able to understand and apply the Knowledge of Reproductive system

**O PO Mapping:**

Slight (Low) = 1, Moderate (Medium) = 2, Substantial (High) = 3 .

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	2	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3

**CO-PSO Mapping:**

Slight (Low) = 1, Moderate (Medium) = 2 ,Substantial (High) = 3.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3

Subject allotment	Course Title	Course Code
Theory	Biochemistry	BTH-104

**Course Outcomes (COs):**

1. Enables the students to understand the applications of thermodynamics in biology

2. Enables the students to understand the concept energy flow in the biological system and electron transport chain
3. Enables the students to understand the structural aspects and metabolism of carbohydrates
4. Enables the students to understand the concept of amino acids, structural organization and metabolism of proteins
5. Enables the students to understand the structure and metabolism of lipids.
6. Enables the students to understand the structure and metabolism of nucleic acids

**CO PO Mapping:**

Slight (Low) = 1 Moderate (Medium) = 2 Substantial (High) = 3

CO/PO	PO1	PO2	PO3	PO4	PO5
CO 1	2	2	2	2	2
CO 2	2	2	2	2	2
CO 3	2	2	2	2	2
CO 4	2	2	2	2	2
CO 5	2	2	2	2	2
CO 6	2	2	2	2	2

**CO-PSO Mapping:**

Slight (Low) = 1 Moderate (Medium) = 2 Substantial (High) = 3

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	2	2	2	2
CO 2	2	2	2	2	2
CO 3	2	2	2	2	2
CO 4	2	2	2	2	2
CO 5	2	2	2	2	2
CO 6	2	2	2	2	2

Subject allotment	Course Title	Course Code
Theory	Enzymology And Biochemical Techniques-	BTH-201

**Course Outcomes (COs):**

1. Enables the pupil to understand the physical techniques involved in the analysis of macromolecules
2. Enables the students to understand the techniques of chromatography
3. Enables the students to understand the techniques of electrophoresis
4. Enables the students to understand the basics of enzymes
5. Enables the students to understand the kinetic parameters and mechanism of action of enzymes.
6. Enables the students to understand the role of coenzymes in enzymatic reaction

**CO-PO Mapping:**

Slight (Low) = 1    Moderate (Medium) = 2    Substantial (High) = 3

CO/PO	PO1	PO2	PO3	PO4	PO5
CO 1	2	1	2	3	2
CO 2	3	2	2	2	2
CO 3	3	1	2	2	2
CO 4	3	2	2	1	2
CO 5	1	2	2	2	2
CO 6	1	2	2	2	2

**CO-PSO Mapping**

Slight (Low) = 1    Moderate (Medium) = 2    Substantial (High) = 3

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	3	2	2	2
CO 2	1	3	2	2	2
CO 3	2	2	2	1	2
CO 4	2	2	2	2	2
CO 5	2	2	2	2	2
CO 6	2	2	2	2	2

Subject allotment	Course Title	Course Code
Practical	Enzymology And Immunology	BTP- 206

**Course Outcomes (COs):**

1. Enables the student to carry out the kinetic assay of salivary amylase
2. Enables the student to carry out the kinetic assay of urease
3. Enables the student to carry out the kinetic assay of acid phosphatase
4. Molecular weight determination of proteins by SDS PAGE.
5. Enables the students to carry out the purification of IgG
6. Enables the students to carry out the serological assays

**CO-PO Mapping**

Slight (Low) = 1    Moderate (Medium) = 2    Substantial (High) = 3

CO/PO	PO1	PO2	PO3	PO4	PO5
CO 1	2	3	3	2	3
CO 2	1	3	3	2	2
CO 3	3	2	2	3	3
CO 4	2	2	1	2	2
CO 5	2	2	2	3	2
CO 6	3	3	2	3	3

**CO-PSO Mapping**

Slight (Low) = 1    Moderate (Medium) = 2    Substantial (High) = 3

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	2	2	2	3
CO 2	2	3	3	1	2
CO 3	2	2	2	2	2
CO 4	3	3	2	2	3
CO 5	3	3	3	3	1
CO 6	3	3	3	3	2

Subject allotment	Course Title	Course Code
Practical	General microbiology and Biochemistry	BTP-107



**Course Outcomes (COs):**

1. Estimation of carbohydrates
2. Estimation of amino acids and proteins
3. Estimation of inorganic phosphate
4. Determination of iodine value and acetyl value
5. Paper chromatography and TLC
6. Microbial culture techniques
7. Biochemical tests in microbiology
8. Staining techniques

**CO PO Mapping:**

Slight (Low) = 1    Moderate (Medium) = 2    Substantial (High) = 3

CO/PO	PO1	PO2	PO3	PO4	PO5
CO 1	3	3	2	3	2
CO 2	3	3	2	3	2
CO 3	3	3	2	3	2
CO 4	3	3	2	2	2
CO 5	3	3	2	3	2
CO 6	3	3	2	2	3
CO 7	3	3	2	3	3
CO 8	3	2	2	3	3

**CO-PSO Mapping:**

Slight (Low) = 1    Moderate (Medium) = 2    Substantial (High) = 3

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	3	2	2
CO 2	3	2	2	2	2
CO 3	3	2	2	2	2
CO 4	3	3	2	2	3
CO 5	3	3	2	2	3
CO 6	3	3	2	3	3
CO 7	3	3	2	3	2
CO 8	3	3	3	3	3

Subject allotment	Course Title	Course Code
Theory	GENERAL MICROBIOLOGY	BTH-103

**Course Outcomes (COs):**

1. Students will learn microbial Classification
2. Students will be able define prokaryotic Micro-organisms (Properties, Structure & Reproduction)
3. Students will be able define eukaryotic Micro-organisms (Properties, Structure & Reproduction)
4. Students will be able to differentiate among Virus, Viroids & Prions
5. Students will be able to analyse microbial Growth and Control
6. Students will be able perform microbiological methods

**CO PO Mapping:**

Slight (Low) = 1    Moderate (Medium) = 2    Substantial (High) = 3

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	2	1	2	2
CO 2	3	3	2	2	3
CO 3	3	2	3	2	2
CO 4	3	2	2	2	2
CO 5	3	2	2	2	2
CO 6	3	3	3	3	3

**CO-PSO Mapping**

CO / PSO	PSO 1	PSO 2	PSO 3	PSSO 4	PSO 5
CO 1	3	3	2	3	3
CO 2	3	2	2	2	2
CO 3	3	2	2	2	2
CO 3	3	2	2	2	2
CO 4	3	2	2	2	2
CO 5	3	2	2	2	2
CO 6	3	2	2	2	2

Subject allotment	Course Title	Course Code
Practical	General Microbiology And Biochemistry	BTP- 107

**Course Outcomes (COs):**

1. Students will learn the techniques of estimation of carbohydrates
2. Students will learn the techniques of estimation of amino acids and proteins
3. Students will learn the techniques of estimation of inorganic phosphate
4. Students will learn the techniques of determination of iodine value and acetyl value
5. Students will learn the techniques of paper chromatography and TLC
6. Students will learn the techniques of microbial culture techniques
7. Students will learn the techniques of biochemical tests in microbiology
8. Students will learn various Staining techniques

**CO PO Mapping**

Slight (Low) = 1    Moderate (Medium) = 2    Substantial (High) = 3

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	2	3	2
CO 2	3	3	2	3	2
CO 3	3	3	2	3	2
CO 4	3	3	2	2	2
CO 5	3	3	2	3	2
CO 6	3	3	2	2	3
CO 7	3	3	2	3	3
CO 8	3	2	2	3	3

**CO-PSO Mapping:**

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	3	2	2
CO 2	3	2	2	2	2
CO 3	3	2	2	2	2
CO 4	3	3	2	2	3
CO 5	3	3	2	2	3
CO 6	3	3	2	3	3
CO 7	3	3	2	3	2
CO 8	3	3	3	3	3



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## CONSOLIDATED CO- PO ATTAINMENT

**M.Sc. Biotechnology**

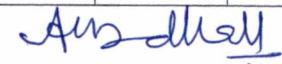
**Semester: 3**

**Course: Genetic Engineering**

**Course Code: BTH-303**

Course Outcomes	CIE I (IA)		OA (Other Assessment)		SEE		Direct Attainment		Feedback		Indirect Attainment		Total Attainment	
	Attainment out of three	Attainment out of 100	Attainment out of three	Attainment out of 100	Attainment out of three	Attainment out of 100	Attainment out of three	Attainment out of 100	Attainment out of three	Attainment out of 100	Attainment out of three	Attainment out of 100	Attainment out of three	Attainment out of 100
BTH-303.1	2.48	82.73	3	100	3	100	2.83	94.24	0.2	6.67	0.1	3.33	2.83	94.24
BTH-303.2	2.73	90.91	3	100	3	100	2.91	96.97	3	100	1.5	50	2.91	96.97
BTH-303.3	2.73	90.92	3	100	3	100	2.91	96.97	2	66.67	1	33.33	2.91	96.97
BTH-303.4	3	100	3	100	3	100	3	100	3	100	1.5	50	3	100
BTH-303.5	3	100	3	100	3	100	3	100	3	100	1.5	50	3	100



  
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