

**MANGALORE UNIVERSITY**  
**DEPARTMENT OF BIOSCIENCES**  
**Syllabus and Scheme for two-year (Four semesters)**  
**M.Sc. in Food Science and Nutrition**  
**Choice-based Credit System (CBCS)**

**Preamble:**

As per guidelines of the UGC and Higher Education Council, Government of Karnataka, the Board of Studies in Food Science and Nutrition, Mangalore University framed a new syllabus according to the regulations governing the Choice-based Credit System for the two-year (four semesters) M.Sc. Degree Programmes in 2016. The syllabus has now been revised.

The M.Sc. programme in Food Science and Nutrition under CBCS scheme has a total of 92 credits consisting of *Hard core courses* for 54 credits (58%) and *Soft core courses* with choice for 28 credits (30%) and *Open elective courses* with choice for a total of 6 credits.

**Program Outcome:**

**PO 1 Interdisciplinary Program:** Food Science and Nutrition is an interdisciplinary programme imparting knowledge of food science and nutrition, dietetics, food microbiology, food biochemistry, food preservation and processing, human physiology, and their role in relation to food and health.

**PO 2. In-depth Understanding:** It also provides an in-depth understanding of the correlation between food and health, role of food under specific disease conditions and applications of food science in food processing industries.

**PO3: Hands-on skills and soft skills training:** Students are provided hands-on skill training through laboratory exercises and are enabled to prepare and deliver effective presentations of technical information to food science and nutrition professionals and to the general public.

**Program Specific Outcomes:**

PSO 1 Apply analytical principles of food and nutrients in diet formulation.

PSO 2 Develop comprehensive and analytical skills to work as trained human resource in food industries and health sectors

PSO 3 Gain insight in public health nutrition for employment food as safety officers, Government sectors like FCI, FSSAI etc.

PSO 4 Apply knowledge in the field of personalized nutrition with reference to nutrigenetics and nutrigenomics

PSO 5 Comprehend methods of assessing human nutritional requirements, nutritional assessment and diet planning.

PSO 6 Understand the applications of nutritional sciences in clinical interventions, communication for health promotion,

PSO 7 Acquire skills to work in R&D units of food processing, food products, nutraceuticals and undertake systematic research in the area of food science and nutrition.

PSO 8 Devise research strategies for empowering and promoting healthy living in the community.

PSO 9 Acquire entrepreneurial skills in the field of food science, processed foods and nutrition.

**FIRST SEMESTER**

Course Code	Course Title	Teaching Hrs/weeks	Exam Hrs.	Marks		Total	Credits
				IA*	Exam		
<b>HARD CORE COURSES – THEORY</b>							
FNH 401	Food Science	4	3	30	70	<b>100</b>	4
FNH 402	Principles of Nutrition	4	3	30	70	<b>100</b>	4
FNH 403	Human Physiology	4	3	30	70	<b>100</b>	4
<b>SOFT CORE COURSES- THEORY (CHOOSE ANY ONE)</b>							
FNS 404	Nutritional Biochemistry	3	3	30	70	<b>100</b>	3
FNS 405	Food Microbiology						
<b>PRACTICALS</b>							
FNP 406	Food Science	4	3	15	35	<b>50</b>	2
FNP 407	Principles of Nutrition	4	3	15	35	<b>50</b>	2
FNP 408	Human Physiology	4	3	15	35	<b>50</b>	2
FNP 409	Nutritional Biochemistry	4	3	15	35	<b>50</b>	2
FNP 410	Food Microbiology						
Total						<b>600</b>	<b>23</b>

**SECOND SEMESTER**

Course Code	Course Title	Teaching Hrs/weeks	Exam Hrs.	Marks		Total	Credits
				IA*	Exam		
<b>HARD CORE COURSES – THEORY</b>							
FNH 451	Vitamins in Human Nutrition	4	3	30	70	<b>100</b>	4
FNH 452	Minerals in Human Nutrition	4	3	30	70	<b>100</b>	4
<b>SOFT CORE COURSES - THEORY (CHOOSE ANY TWO)</b>							
FNS 453	Life Span Nutrition	3	3	30	70	<b>100</b>	3
FNS 454	Analytical Techniques in Food Science						
FNS 455	Food Packaging	3	3	30	70	<b>100</b>	3
FNS 456	Food Safety and Quality Control						
<b>PRACTICALS</b>							
FNP 457	Vitamins in Human Nutrition	4	3	15	35	<b>50</b>	2
FNP 458	Minerals in Human Nutrition	4	3	15	35	<b>50</b>	2
FNP 459	Life Span Nutrition	4	3	15	35	<b>50</b>	2
FNP 460	Analytical Techniques in Food Science						
FNP 461	Food Packaging	4	3	15	35	<b>50</b>	2
FNP 462	Food Safety and Quality Control						
<b>OPEN ELECTIVES (CHOOSE ANY ONE)</b>							
FNE 463	Food Safety	3	3	30	70	<b>100</b>	3
FNE 464	Food Preservation						
Total						<b>700</b>	<b>25</b>

### THIRD SEMESTER

Course Code	Course Title	Teaching Hrs/week	Exam Hrs.	Marks		Total	Credits
				IA*	Exam		
<b>HARD CORE COURSES – THEORY</b>							
FNH 501	Clinical Nutrition and Dietetics – I	4	3	30	70	100	4
FNH 502	Community Nutrition and Statistics	4	3	30	70	100	4
<b>SOFT CORE COURSES - THEORY (CHOOSE ANY TWO)</b>							
FNS 503	Dairy Technology	3	3	30	70	100	3
FNS 504	Principles of Food Processing						
FNS 505	Post Harvest Technology	3	3	30	70	100	3
FNS 506	Functional Foods						
<b>PRACTICALS</b>							
FNP 507	Clinical Nutrition and Dietetics – I	4	3	15	35	50	2
FNP 508	Community Nutrition and Statistics	4	3	15	35	50	2
FNP 509	Dairy Technology	4	3	15	35	50	2
FNP 510	Principles of Food Processing						
FNP 511	Post Harvest Technology	4	3	15	35	50	2
FNP 512	Functional Foods						
<b>OPEN ELECTIVES (CHOOSE ANY ONE)</b>							
FNE 513	Nutrition for Health	3	3	30	70	100	3
FNE 514	Diet and Disease						
<b>Total</b>						<b>700</b>	<b>25</b>

### FOURTH SEMESTER

Course Code	Course Title	Teaching Hrs/weeks	Exam Hrs.	Marks		Total	Credits
				IA*	Exam		
<b>HARD CORE COURSES – THEORY</b>							
FNH 551	Clinical Nutrition and Dietetics – II	4	3	30	70	100	4
FNH 552	Food Preservation	4	3	30	70	100	4
<b>SOFT CORE COURSES - THEORY (CHOOSE ANY ONE)</b>							
FNS 553	Food Fortification	3	3	30	70	100	3
FNS 554	Sports Nutrition						
FNS 555	Food Service Management						
<b>PRACTICALS</b>							
FNP 556	Clinical Nutrition and Dietetics – II	4	3	15	35	50	2
FNP 557	Food Preservation	4	3	15	35	50	2
<b>PROJECT WORK / INTERNSHIP</b>							
FNP 558	Project Work / Internship	-	-	30	70	100	4
<b>Total</b>						<b>500</b>	<b>19</b>
<b>Grand Total</b>						<b>2500</b>	<b>92</b>

IA consists of Seminars, Assignments, Internal Tests, Objective test (MCQs)

	HARD CORE COURSES			SOFT CORE COURSES			OPEN ELECTIVES	PROJECT / INTERNSHIP	TOTAL
	No of Courses	Credits	Total	No. of Courses	Credits	Total	Credits	Credits	
I	3Th+3 Pr	4+2	18	1Th+1 Pr	3+2	5	-	-	23
II	2Th+2 Pr	4+2	12	2Th+2 Pr	3+2	10	3	-	25
III	2Th+2 Pr	4+2	12	1Th+1 Pr	3+2	10	3	-	25
IV	2Th+2 Pr	4+2	12	1Th	3	3		4	19
<b>Total</b>			<b>54=58%</b>			<b>28=30%</b>	<b>6</b>	<b>4</b>	<b>92</b>

**NOTE:**

**INTERNAL ASSESSMENT:** Marks in theory courses shall be awarded on the basis of theory test (70 Marks), Objective test (MCQs)(15 Marks), Seminars and Assignments (15 Marks). The marks obtained shall be reduced to 30. The tests will be conducted as per the university time schedule. Practical Internal Assessment marks shall be based on practical test and records. 30 marks for Practical test and 5 marks for Class record. The marks obtained shall be reduced to 15. 30 marks for Project/Internship work (Report/Dissertation and Presentation/Viva).

**THEORY QUESTION PAPER PATTERN:** Question Papers in all the four semesters consists of three sections (Model question paper enclosed). Section I: Write short notes on any five out of eight of the following (5x3=15 Marks) Section II: Write explanatory/brief notes on any five out of eight of the following: (5x5=25 Marks). Section III: Answer any three out of five of the following (3x10=30 Marks). Questions should be drawn from all the units of the syllabus by giving equal weightage.

**PRACTICAL QUESTION PAPER PATTERN:** 30 marks for practical examination proper (Major experiment (10 marks), Minor experiments (05+05 marks), Identify and Comment (5x2=10 marks) and Class record (05 marks). The Project work may be conducted either in the department or any other Institution/ Industry/ Hospital. Project/ Internship Report/ Dissertation carries 70 marks and evaluated as per regulations.

**I SEMESTER**  
**HARD CORE COURSES**  
**FNH 401 FOOD SCIENCE**

**52 Hrs (13× 4 units)**

**Course Outcome:**

*At the end of the course the students will acquire the knowledge of -*

- CO 1. Various nutritional classification of food grouping system
- CO 2. Structure of cereal grains, nutritional importance, processing and baking technology.
- CO 3. Classification of fruits and vegetables, their nutritional importance, the methods of preservation and effect of cooking on nutritional composition.
- CO 4. Concept of milk processing, its composition and to assess the quality parameters of milk.
- CO 5. Composition of meat and egg, regulations and processing of meat in slaughtering operations and evaluation of egg quality.

**Unit I:** Introduction to Food Science: Food Group System (5/11 groups and ICMR). 3hrs  
Cereals and Pulses: Nutritive value of cereals and pulses. Cereals – structure of a cereal grain, milling of cereals (rice and wheat), parboiling and nutrient loss during parboiling. Baking technology: bread, biscuits, cookies, leavening agents (different types and methods), Breakfast cereals. Pulses – types and processing of different pulses. Processing of pulses-effects of decortications, soaking, germination and fermentation. 9hrs

**Unit II:** Fruits and vegetables: Classification and Nutritive value, Principles of fruits and vegetable preservation (heat, sugar, salt, fermented and dried). Pre-processing of fruits and vegetables (peeling, cutting and blanching). Principles of storage; natural, ventilated, low temperature. Pectin substances, ripening of fruits. Vegetable cookery Preliminary preparation- Washing, Peeling and Blanching, Enzymatic and non enzymatic browning, its prevention. Fruit and vegetable juices, cordials, nectars, concentrates, jam, jellies, squash, syrups, marmalades, pickles. Theory of gel formation.

**Unit III:** Milk and milk products: Milk composition, factors affecting milk quality, physical and chemical properties of milk. Processing of milk- Filtration, Clarification, separation, centrifugation, pasteurization, fortification, sterilization, homogenization, effect of processing on nutritive value. Quality test for milk-platform test, adulterant test and other quality checks. Fermented and non-fermented milk products.

**Unit IV:** Meat, fish, poultry and egg: Meat- composition, slaughtering and related practices, ageing, and curing, smoking, tenderizing, colour changes during cooking. Fish - composition, quality factors, preservation, drying, salting, curing, smoking, fermented fish products and canning. Poultry- processing plant operation (slaughtering to packaging), cooking, flavor and colour changes. Eggs - composition, quality factors, pasteurization of eggs, egg substitutes and powdered egg, role of egg in cookery.

**REFERENCES**

- Fabriani, G and Lintas C. 1988. Durum wheat chemistry and technology. American Association of Cereal Chemistry Inc.
- Winton and Winton 1991. Techniques of food analysis, Allied Scientific Publishers
- Pomeranz Yeshuraj, Food Analysis; theory and practice

- Matz A Samuel, Bakery Technology and Engineering
- Lavie A., 1979. Meat Handbook- AVI Publishing, Westport

## FNH 402 PRINCIPLES OF NUTRITION

**52Hrs (13× 4 units)**

### **Course Outcome:**

*At the end of the course, students will gain-*

- CO 1. Knowledge about the total energy requirements, balance and its concepts depending on the individual specific needs.
- CO 2. An understanding of body composition and its changes through life cycle and the techniques of measuring body composition.
- CO 3. Knowledge regarding carbohydrate chemistry and its role in energy metabolism.
- CO 4. Knowledge of protein, its metabolism and importance in normal physiological function of the body.
- CO 5. Basic understanding of requirements, metabolism, functions and deficiencies of lipids.

**Unit I: Principles of nutrition** – Food as a source of nutrients, Nutritional classification of foods. Basis for computing nutrient requirements, latest concepts in dietary recommendations, RDA- ICMR and WHO: their uses and limitations. Body Composition. Changes in body composition through life cycle.

Energy Metabolism: BMR, energy balance, physical activity, energy expenditure calculation of an average man and woman. Importance of water and fibers in human nutrition.

**Unit II:** Carbohydrates: Classification, functions, digestion and enzymes involved, absorption, assimilation, deficiency, metabolism, requirements and sources. Significance of carbohydrate as energy source; trends in dietary intake of carbohydrate. Glycemic index of foods – scope and significance, glycemic load of foods and its use. Artificial sweeteners.

**Unit III:** Proteins: Functions, digestion and enzymes involved, absorption, assimilation, Nitrogen balance, amino acid pool, requirements. Protein supplements. Quality of protein analysis, essential amino acids and therapeutic application of amino acid. Protein energy malnutrition – clinical features and biochemical changes.

**Unit IV:** Lipids: Significance of lipids and fatty acids, functions, deficiency, SFA, PUFA, MUFA, omega 3 fatty acids and omega 6 fatty acids, trans fatty acids, requirements and dietary guidelines, fat metabolism – digestion and enzymes involved, absorption and assimilation.

### **REFERENCES**

- Honyman and Guthri - 2000. An introduction to the chemistry of carbohydrates
- Birch, G.G. et al., 1986. Food science- Pergamon press, New York
- Fennema, O R., 1976 Principles of Food Science (part- I Food Chemistry)- Marcel Dekker, USA,
- Guthrie A.H., 1986. Introductory Nutrition –6<sup>th</sup>edition, the C.V. Mosby company
- Swaminathan M., 1991. Essentials of food and nutrition - Vol I and II, Ganesh & Co. Madras
- Berg JM, Tymoczko JL and Stryer L., 2002. Biochemistry 5<sup>th</sup>ed. WH Freeman

## FNH 403 HUMAN PHYSIOLOGY

52 Hr (13× 4 units)

### Course Outcome:

*At the end of the course students will be able to-*

- CO 1. Enhance their knowledge of human physiology.
- CO 2. Understand physiological systems such as cardio-vascular, excretory, reproductive and digestive systems.
- CO 3. Identify the movement and coordination of human body, structure and physiology of various muscle systems, hormones and its regulatory functions.
- CO 4. Understand the interrelationship between various physiological and metabolic processes.

**Unit I:** Transport and Defence: Blood: composition, plasma, blood cells, hemoglobin, blood clotting process, heartbeat, initiation, contraction and regulation, physiology of circulation. Adipose tissue structure, composition, deposition of triglycerides in adipose tissues, role of brown adipose tissues in thermogenesis. Immunity: immune response, antibody, cell mediated and humoral immunity.

**Unit II:** Movement and co-ordination: Organization of body, structure of skeletal, cardiac, smooth and physiology of muscle contraction, structure of brain and neurons, physiology of nerve impulse conduction, excitability of membrane, electrical and chemical transmission between cells. Hormones: classification, synthesis, regulatory functions and mechanisms of hormone action (specification)

**Unit III:** Digestion: Structure of digestive tract, regulators of GI activity, mechanical and chemical aspects of digestion, and transport of major nutrients. Liver- role of liver in processing and distribution of nutrients absorbed from small intestine, inter relationship of major metabolism in liver. Detoxification: Definition. Xenobiotics, enzyme systems involved mechanisms of detoxification. Oxidative stress and anti-oxidants in health, free radicals, role of free radicals and anti oxidants in health and diseases.

**Unit IV:** Excretion, detoxification and reproduction: Excretion: Internal structure of kidney and nephron, fluid and electrolyte balance, acid and base balance, physiology of excretion, roles of kidney in body water regulation. Reproductive health and nutritional requirements

### REFERENCES

- Chatterjee C C., Human physiology Vol I &II, Medical Allied agencies
- Mukherjee W F., Review of medical physiology, Tata McGraw-Hill
- Jain A K Text book of Physiology Vol I &II, Avical Publishing Co., New Delhi
- Guyton A C. Hall, J E. 1996. Textbook of Medical Physiology 9<sup>th</sup>Ed., Prism Books Pvt. Ltd., Bangalore
- Sembulingam, 2009. Text book of medical physiology.

**SOFT CORE COURSES**  
**FNS 404 NUTRITIONAL BIOCHEMISTRY**

**39 hr (13× 3 units)**

**Course Outcome:**

*At the end of this course the students will be able to-*

- CO 1. Describe macronutrients, energy metabolism, its utilization, and the general functions.
- CO 2. Understand nucleotides, structure and its properties
- CO 3. Identify biological oxidation and electron transport chain taking place in an organism.
- CO 4. Describe the classification, nomenclature and other basic concepts of enzymes and hormones.

**Unit I:** Nutrient metabolism: Carbohydrates - Glycolysis, TCA Cycle, HMP shunt, Energy metabolism, energy production, gluconeogenesis, gluconeogenesis. Proteins and Amino acids: Synthesis, metabolism, denaturation, transamination, decarboxylation, urea formation, synthesis and break down of hemoglobin. Functions and classification of nucleotides, structure and properties of RNA and DNA. Lipids: Synthesis of saturated and unsaturated fatty acids, cholesterol synthesis and regulation, oxidation of saturated and unsaturated fatty acids, phospholipids and lipoprotein synthesis.

**Unit II:** Biological oxidation and Electron Transport Chain: Reduction potentials, anatomical site and components of oxidative phosphorylation, enzymes involved, membrane location of electron transport, chemiosmotic theory, inhibitors of respiratory chain

**Unit III:** Enzymes and Hormones: Enzymes - Classification, nomenclature, general properties- stereo and reaction specificity, kinetics and mechanisms of enzyme action, regulation of enzyme activity. Coenzymes and co factors, their structure and functions. Enzyme inhibition, isoenzymes, immobilized enzymes, estimation of enzyme activity, clinical significance of enzymes and enzyme based assays. Hormones - Classification, regulatory functions and mechanisms of hormone action. Prostaglandin - structure, biosynthesis, metabolism and biological action and their role in pathology.

**REFERENCES**

- Raghuramulu N., Madhavan Nair K and Kalyansundaram S. 1983. A manual of laboratory techniques edited by NIN-ICMR
- Tietz NW (Ed). 1976. Fundamentals of clinical chemistry, WB Saunders Co.
- Jain J.L. Fundamentals of biochemistry, S. Chand & Company Ltd, Ram New Delhi
- Delvin T M., Text book of biochemistry with clinical correlation, Wiley Liss Inc
- Murray R K., D K Granner, P A Mayes, V W Rodwell Harpers biochemistry, Macmillan Worth Publishers



## FNS 405 FOOD MICROBIOLOGY

39 Hr (13× 3 units)

### Course Outcome

*At the end of this course students will be able to-*

- CO 1. Identify microorganisms associated with food.
- CO 2. Describe different type of microbes present and their beneficial as well as deleterious effect on food.
- CO 3. Understand food borne pathogens, food spoilage and toxins produced by them and its health effect.
- CO 4. Assess the importance of microbes in food industry for baking, fermentation and various traditional foods.

**Unit I:** History and scope of food microbiology. Types of micro-organisms associated with food- mold, yeast, and bacteria, Microbial growth pattern, physical and chemical factors influencing destruction of microorganisms. Growth curve, bacterial group based on morphology- gram positive, gram negative, motile, non-motile, sporulating and non sporulating. Microorganisms in natural food products and their control.

**Unit II:** Food spoilage and food borne diseases: Food spoilage - definition, biochemical changes caused by microorganisms, deterioration and spoilage of various types of food products – Physical, chemical and microbiological spoilages (Enzymatic or fermentative spoilage – rancidity, hydrolytic spoilage, putrefaction, souring, off flavour etc.; Texture deformations – slime, ropiness, curdling, discoloration etc.; Contamination of fruits vegetables, cereals, pulses, oilseeds, milk and meat during handling and processing. Microbial spoilage of foods and food items – milk, cereals, fruits and vegetables, meat, egg, fish, poultry. Toxin production–endotoxins and exotoxins). Food borne diseases and infections, mycotoxins, typhoid, diarrhea, botulism, salmonellosis, staphylococcal intoxication. Food borne pathogens, food poisoning, food infection and intoxication - *E. coli* O157:H7, *Campylobacter jejuni*, *Bacillus cereus*, *Shigella* sp., Hepatitis A. Assessing the microbiological quality of food – indicator organisms, microbiological standards, principals of GMP and HACCP in food processing.

**Unit III:** Fermentation: Importance of microorganisms in food industry and food preparations (milk industry, meat, fish, baking). Food fermentation -Traditional fermented foods of India and other Asian countries; Probiotics and prebiotics: effect on gut microflora. Fermented foods based on milk, meat and vegetables; Fermented and alcoholic beverages.

### REFERENCES

- Banwart G J., 1987, Basic Food Microbiology, CBS Publishers and Distributors
- Frazier WC, Westoff DC. 1998, Food Microbiology, 4<sup>th</sup> Edition, Tata Mc Graw Hill Publishing Co. Ltd
- Prescott L M, Harley J P, Klein D A., 2008. Microbiology 6th Ed., WMC Brown Publishers
- Pelczar MJ, Chan ECS, Krieg N. 1993. Microbiology 5<sup>th</sup> Ed., Tata McGraw Hill Publishing Co. Ltd
- Garbutt John, 1997. Essentials of Food Microbiology, Arnold London
- James M. Jay, 2000. Modern Food Microbiology 6th edition AN ASPEN PUBLICATION® Aspen Publishers, Inc.

**PRACTICALS**  
**FNP 406 FOOD SCIENCE**

**Course Outcome:**

*At the end of this course the students will be skilled in the -*

- CO 1. Application of cereal and pulse cookery in food science.
- CO 2. Detecting chemical reactions in fruits and vegetables and various methods used in preservation
- CO 3. Assessing the milk quality using various parameters.
- CO 4. Evaluation of eggs and egg cookery.

1. Cereals

Cereal cookery

Methods of cooking fine and coarse cereals

Preparation of selected Indian Cereal recipes

Pulses cookery

Cooking soaked and raw pulses

Effects of adding salt, acid and alkali on cooking

Preparation of baked products using leavening agents (bread, biscuits, cookies)

2. Fruits and Vegetables

Effect of acid and alkali

Browning reaction

Preparation of dishes with fruits and vegetables (different modes of cooking)

3. Milk

Milk adulteration test

Milk platform test, pH, sensory evaluation

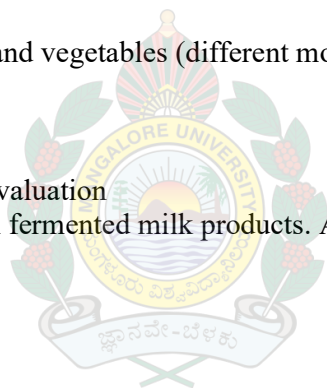
Preparation of fermented and non fermented milk products. Analysis of chemical properties of milk

Specific gravity

Total solids

Acidity

Lactose content



4. Egg

Egg quality evaluation

Egg cookery

**FFNP 407 PRINCIPLES OF NUTRITION**

**Course outcome:**

*At the end of this course the students will be thorough with-*

- CO 1. Laboratory techniques common to basic food chemistry.
- CO 2. Analytical techniques used for food products
- CO 3. Evaluating chemical properties and estimating carbohydrates and proteins quantitatively and qualitatively.
- CO 4. Estimating quantity of lipids in various food samples by using various methods.

- 1. Determination of energy value of food using Parr oxygen bomb calorimeter

2. Glucose estimation (reducing sugar method or Willstates method)
3. Test for protein (qualitative analysis)
4. Nitrogen analysis by Kjeldhal method
5. Estimation of amino acid by Sorenson's formaldehyde titration method
6. Protein estimation by Lowry's method
7. Crude lipid estimation- groundnut, egg yolk, soya product
8. Estimation of total lipid in egg yolk

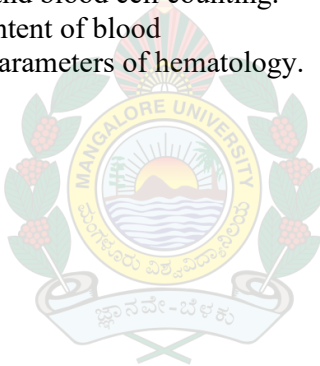
### **FNP 408 HUMAN PHYSIOLOGY**

**Course outcome:**

*At the end of this course the students will be able to-*

- CO 1. Identify different blood grouping,  
 CO 2. Handel hemocytometer and blood cell counting.  
 CO 3. Estimate hemoglobin content of blood  
 CO 4. Identify other different parameters of hematology.

1. Study of hemocytometer
2. Blood groups
3. Estimation of hemoglobin
4. Total WBC count
5. Total RBC count
6. Total platelet count
7. Packed cell volume
8. Blood indices



### **FNP 409 NUTRITIONAL BIOCHEMISTRY**

**Course outcome:**

*At the end of this course the students will be able to-*

- CO 1. Use techniques and instruments for biochemical analysis of different biological samples.  
 CO 2. Use colorimetric techniques.  
 CO 3. Analyze blood parameters.  
 CO 4. Analyze the urine samples using different qualitative and quantitative methods.

1. Techniques used in biochemical analysis
  - Determination of pH in acids, alkalis and buffers using pH meter and indicators
  - Colorimeters – use of colorimeter in UV and visual range, flame photometer, flourimeter (principle to be explained and demonstrated with one example foreach)
  - Separation techniques- chromatography- paper and Column. Centrifugation, electrophoresis and dialysis (one example for each may be demonstrated)
2. Blood analysis- enumeration of RBC & WBC. Blood glucose, serum albumin, globulin, phosphorous, calcium, cholesterol and urea.
3. Urine analysis- quantitative- sugar, albumin and microscopy

### **FNP 410 FOOD MICROBIOLOGY**

**Course outcome:**

*At the end of this course the students will be able to-*

- CO 1. Identify basic microbiological laboratory practice, culturing and handling of microbes.  
 CO 2. Isolate microorganisms from water and food sources.

CO 3. Identify by various staining techniques.

CO 4. Estimate total count in various food samples.

1. Study of microbiological laboratory instruments.
2. Preparation of media and isolation techniques
3. Preparation of bacterial smears, simple staining, differential staining, spore staining, staining of molds and yeast
4. Study of the microbiological quality of milk by MBR test.
5. Direct microscopic examination of foods.
6. Estimation of total microbial count of yeast and molds from spoiled food samples.
7. Estimation of total microbial bacterial plate count of spoiled food sample
8. Enumeration of Coliforms and indicator organisms (Most Probable Number)
9. Detection of Coliforms using membrane filter techniques.
10. Estimation of total microbial count of (a) milk products (b) fruits and vegetable products (c) meat, fish and poultry products (d) canned foods.

