M.Sc. Biochemistry CBCS Structure under the Faculty of ALLIED & APPLIED SCIENCE

	CORE COURSES (12)	ABILITY ENHANCEMENT (2)	SKILL ENHANCEMENT (3)	DISCIPLINE SPECIFIC (2)
SEMESTER -I	MSBC-CC-101 (Biophysical Chemistry & Bio-organic Chemistry) MSBC-CC-102 (Bio-molecules) MSBC-CC-103 (Human Physiology)	MSBC-AE-101 (English Communication)	MSBC-SE-101 (Biostatistics)	
SEMESTER -II	MSBC-CC-201 (Nutrition) MSBC-CC-202 (General Biochemistry) MSBC-CC-203 (Enzymology)	MSBC-AE-201 (Green Chemistry)	MSBC-SE-201 (Fundamentals of Yoga & Ayurveda)	MSBC-DS-201 Summer Internship at a Biochemistry/ Pathological laboratory/ Industry 2 credits
SEMESTER -III	MSBC-CC-301 (Molecular Biology) MSBC-CC-302 (Biotechnology) MSBC-CC-303 (Microbiology)		MSBC-SE-301 MOOC-1	
SEMESTER -IV	MSBC-CC-401 (Bioinformatics) MSBC-CC-402 (Biochemistry of Diseases) MSBC-CC-403 (Physiology (Plant))		MSBC-SE-401 Herbal Drug Development	MSBC-DS-401 (Dissertation) 4 credits
TOTAL	12 PAPERS THEORY 12X4CREDITS=48 PRACTICAL 12X2CREDITS=24	2 PAPERS 2X2 CREDITS=4	4 PAPERS 4X2 CREDITS=8	2 PAPERS 2+ 4= 6 credits
OVERALL CREDITS	90			

M.Sc (Biochemistry)

Detailed Syllabus

M.Sc in Biochemistry or Master of Science in Biochemistry is a two-year full time postgraduate degree programme that deals with the study and application of various chemical procedures and their analysis including respirations, metabolism at a cellular level or a molecule level in a living organism. Students who have a relevant background education such as a B.Sc degree in microbiology, biochemistry, chemistry, biology or a similar field can pursue M.Sc in Biochemistry.

Preamble: The learning outcomes are designed to help learners understand the objectives of studying M.Sc. Biochemistry that is, to analyse, appreciate, understand the basic concepts of chemical reactions that occur in living systems, which enable them to understand the various perspectives of applied sciences that benefit the mankind.

Objectives

The Students of M.Sc. Biochemistry programme will learn experimentally and theoretically about the chemistry of biological phenomenon of living organisms. The course aims to provide the skills of identifying scientific issues, developing hypothesis based on literature, designing experiments and displaying results for betterment of mankind.

Learning Outcomes

1. Be able to design and perform Scientific experiments and analyse the resulting data.

2. Able to work as a member of team.

3. Be knowledgeable in classical laboratory techniques and be able to use modern instrumentation.

4. Knowledgeable of ethical practice in science.

5. Be able to access knowledge and use the chemical literature and research.

MSBC-CC-101

BIOPHYSICAL CHEMISTRY&BIOORGANIC CHEMISTRY:

Course Objective:

1. Developing of general understanding how physical laws govern biological processes.
2. Acquire basic knowledge about how physical methods can be applied to understand biological processes.

3. Developing an understanding of the relation between structure, function and dynamics of biological macromolecules.
4. Developing an understanding of the forces governing protein folding and misfolding

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hts/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit 1

Protein structure, DNA structure, Enthalpy, heat capacity, and chemical reactions, conformation, interactions and folding of biological macromolecules, thermodynamics, titration, sedimentation, electrophoresis, mass spectrometry nmr, epr, x-ray diffraction light scattering, uv/ vis absorption, circular dichroism, emission, osmosis, osmotic stress/molecular crowding, equilibrium dialysis, single molecule techniques, Entropy, the third law and Gibbs energy, The chemical potential, molar Gibbs energy, Equilibrium, Molecular Biophysics, Electrochemistry and applications,

Unit 2

Introduction to Bioorganic Chemistry: Overview of Bioorganic Chemistry- Historical Connection between Organic and Biological Chemistry; Weak Interactions in Organic and Biological World;Proximity Effect in Organic Chemistry; Molecular Recognition; Chemistry of the Living Cells; Analogy Between Biochemical and Organic Reaction. Bioorganic Chemistry of Enzymes

Unit 3

Introduction to Enzyme Catalysis and Kinetics; Enzyme Inhibition and Drug design; Enzyme in Organic Chemistry; Antibody Catalyzed Organic Reaction; Enzyme Models: Biomimetic Polyene Cyclisation; Squalene Biosynthesis. History, Sugars and bases; Conformation of sugar-phosphate backbone; hydrogen bonding by bases; the double helix; A,B, and Z double helices; Stability of Double Helix

Unit 4

Carbohydrates, lipids, proteins, enzymes, nucleic acids, and Metalloproteins

Practical in BIOPHYSICAL CHEMISTRY & BIOORGANIC CHEMISTRY: MSBC-CC-101-P Credit: 2

1. Preparation of Buffers and measurement of pH using pH papers and pH meter.
2. Acid –Base titration of a Polyprotic acid
3. Extraction of citric acid from lemon juice
4. Determination of viscosity by Ostwald's viscometer
5. A study of some methods of cell rupture: effect of hypo, hyper andisotonic solutions on cells of the onion peel /plant cell (Hydrilla/Vallisneria/ Spirogyra)

Course Outcome:

- Students will demonstrate a core knowledge base in the theory and practice of modern Biophysical chemistry and Bioorganic chemistry.

- Students will function successfully in the laboratory and use safe laboratory practices.

- Students will critically evaluate data and design experiments to test hypotheses relevant to the practice of biochemistry and biophysics.

- Students will read and evaluate primary literature in the discipline.

- Students will effectively communicate scientific data and ideas, using various formats appropriate for different target audiences.

Recommended Books:

1. P.W. Atkins: Physical Chemistry, Oxford University Press
2. R.T. Morrison & R.N.Boyd: Organic Chemistry, Prentice Hall
3. Physical Biochemistry, David Freifelder, Applications to Biochemistry and Molecular Biology, 2nd Edition, W.H. freeman and Company, 2005.
4. Keith Wilson and John Walker, Principles and Techniques of Biochemistry and Molecular Biology, 6th Edition, Cambridge University Press, 2005

MSBC-CC-102

BIOMOLECULES:

Course Objective:

- This paper trains students to appreciate the salient features of biomolecules in the organization of life.
- It spans over the significance and methodology involved in characterizing major biomolecules.
- It helps the students in understanding the classification, functions and application aspects of various biomolecules

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hts/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit 1

Biomolecules: This subject is divided into two sections- one part is Biomolecules which includes carbohydrates, lipids, proteins, enzymes, nucleic acids etc., Definition, empirical formulae, classification, classification, biological importance of all biomolecules

Unit 2

Biological importance of all biomolecules, Monosaccharides: Configuration relationship of D-aldoses, D-ketoses. General properties of aldoses and ketoses.Oxidation, reduction, reducing property, formation of glycosides, acylation, methylation, condensation – phenyl hydrazine, addition – HCN.

Unit 3

Interconversion of aldoses and ketoses by chemical method. Ascending and descending the series by chemical methods, Stereochemistry of monosaccharides, (+) and (-), D and L, epimers, anomers, and diastereoisomers, Glucose: Elucidation of open chain structure and ring structure of glucose. Conformation of glucose (only structures), mutarotation.

Unit 4

Structure of galactose, mannose, ribose and fructose. Structure and biological importance of amino sugars, deoxy sugars, sugar acids, neuraminic and muramic acid, Disaccharides, Polysaccharides, Glycosaminoglycans, AMINO ACIDS, Peptides, Proteins, lipids.

Practical in BIOMOLECULES: MSBC-CC-102-P

Qualitative analysis of Biomolecules

i) Carbohydrate – Glucose, Fructose, Lactose, Maltose and Sucrose.

ii) Proteins – Precipitation reactions of proteins, Colour reactions of proteins, Colour reactions of amino acids like tryptophan, tyrosine, cysteine, methionine, arginine, proline and histidine.

iii) Lipids– solubility, acrolein test, Salkowski test, Lieberman-Burchard test.

iv) Qualitative tests for nucleic acid.

Course Outcome:

After gaining the knowledge on biomolecules the students should be able to understand

- The relationship between the properties of macromolecules and cellular activities,
- The relationship between cellular activities and biological responses,
- Cell metabolism, chemical composition, physiochemical and functional organization of organelles,
- Gene replication, expression, regulation and mutation,
- Cell signaling, trafficking and differentiation, and
- Contemporary approaches and techniques used in modern cell and molecular biology.

Recommended Books:

1. Physical Biochemistry, David Freifelder, Applications to Biochemistry and Molecular Biology, 2nd Edition, W.H. freeman and Company, 2005.
2. Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning
3. Campbell, PN and Smith AD (2011) Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
4. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
5. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company
6. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company,

MSBC-CC-103

HUMAN PHYSIOLOGY:

Course Objective:

This course covers the physiology of humans, with emphasis on the major organs and the processes they govern, including heart function and circulation, muscle function and movement and the kidney and osmo-regulation. Other topics will include energetics and temperature regulation, respiration and digestion.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hts/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit 1

Cellular Basis of Physiology, Genetics & Enzymes, Biophysical Principles and Chemistry of Biomolecules, Cell Signalling & Nerve-muscle Physiology, Nervous System, NERVE MUSCLE PHYSIOLOGY , Blood and Body Fluids,

Unit 2

Cardiovascular System, Respiratory system, Digestion and Metabolism, Nervous system, excretory system and physiology, Histology, Endocrine System, Human Anatomy,

Unit 3

Immunology and Immunisation Program, Sensory Physiology, Haematological Test, Nutrition and Dietetics Public Health, Special Senses

Unit 4

Bio-physical science, developmental biology, excretory physiology, haematology, Study of brain and its function, Immunology

Practical (Human Physiology) MSBC-CC-103-P

1. Demonstration of uses of instruments or equipments

2. Qualitative uses of carbohydrates, proteins and lipids

3. Normal characteristics of urine

4. Abnormal constituents of urine

5. Quantitative estimation of glucose, total proteins, uric acid in blood

6. Liver function test

7. Kidney function tests

8. Lipid profile

9. Interpretation and discussion of results of biochemical tests

Course Outcome:

On satisfying the requirements of this course, students will have the knowledge and skills to:

1. Describe the structure of major human organs and explain their role in the maintenance of healthy individuals.
2. Explain the interplay between different organ systems and how organs and cells interact to maintain biological equilibria in the face of a variable and changing environment.
3. Use complex electronic equipment to record human physiological data, and responses to experimental stimuli.
4. Interpret and draw inferences from experimental measures of physiological function including electrocardiograms

Recommended Books:

- Guyton and Hall Textbook of Medical Physiology by John E. Hall
- Berne and Levy Physiology by Matthew N. Levy, Bruce M. Koeppen, Bruce A. Stanton
- Physiology by Linda S. Costanzo

Course Code: MSBC-AE-101

Course Title: English Communication

Credits:2

Course objectives:

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced. The present course hopes to address some of these aspects through an interactive mode of teaching- learning process and by focusing on various dimensions of communication skills. Some of these are: Language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note-taking etc. While, to an extent, the art of communication is natural to all living beings, in today's world of complexities, it has also acquired some elements of science.

Total Number of Hrs. : 30		**Theory**	**Practical**	**Tutorial**
Credits		**2**	**-**	**-**
Hrs/Week		**2**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 50				
Theory:50		**Practical: NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
30	**20**	**-**	**-**	

SYLLABUS

Unit-1:-Communication-Introduction to Language and Communication

What is Language? Language as Communicative Medium: Meaning and Signs, Codes, Signification; Oral, Print and Digital Communication: their evolution over time and their socio-personal impact.

Unit 2: Communication - Theory and Types

Theory of Communication, Types and modes of Communication, Verbal and Non-verbal (Spoken and Written), Barriers and Strategies, Inter-personal and Group communication.

Unit 3: Listening and Speaking skills

Basic English Sounds, Importance of Listening Skills, Types of Listening Skills, Barriers to Listening and Effective Listening, Dialogue, Group Discussion, Effective Communication/ Mis-Communication Interview

Unit 4: Reading and Understanding

Close Reading Comprehension, Summary, Paraphrasing, Analysis and Interpretation

Unit 5: Writing Skills

Documenting, Report Writing, Making notes, Letter writing, CV writing, Essay writing and Creative writing.

Learning Outcomes:

At the end of the course, the students are expected to have developed the capability to share their thoughts, emotions and ideas in both communication and writing; they should find a difference in their personal and professional interactions.

PRESCRIBED TEXT:

Connect: Course in Communicative English, Debashis Bandyopadhyay & Malathy Krishnan Cambridge University Press, New Delhi, 2018

RECOMMENDED READINGS:

1. Fluency in English - Part II, Oxford University Press, 2006.

2. Business English, Pearson, 2008.

3. Language, Literature and Creativity, Orient Blackswan, 2013.

4. Enrich Your English, OUP, SR Inthira and V. Saraswathi, CIEFL,1997

5. Oxford A-Z of English Usage, ed. Jeremy Butterfield, OUP, 2007.

6. Longman Dictionary of Common Errors, N.D. Turton and J.B. Heaton, Longman, 1998.

MSBC-SE-101

BIOSTATISTICS:

Credit-2

Course Objective:

The Biostatistics course objectives are

1. It helps learners to analyzing data from various biological experimental problems.

2. It helps to determine the appropriate sampling techniques and coordinate data collection procedures.

3. It helps to conduct statistical analyses to answer scientific questions.

Total Number of Hrs. : 30		**Theory**	**Practical**	**Tutorial**
Credits		**2**	**-**	**-**
Hrs/Week		**2**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 50				
Theory:50		**Practical: NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
30	**20**	**-**	**-**	

Unit 1

Descriptive Statistics, Elements of Demography, Health Data Management & Computer Programming, Probability Theory and Distributions,

Unit 2

Bio-statistical Inference, Research Methodology, Sampling Theory, Statistical Genetics

Unit 3

Design of Experiment, Epidemiology, Generalized Linear Models, Survival Analysis, Applied Multivariate Analysis, Clinical Trials

Unit 4

Computer-Intensive Statistical Methods

Recommended Books:

1. Danniel, W.W. (1987), Biostatistics, New York, John Wiley Sons.
2. Banerjee, P. (2001), Introduction to Biostatistics, S. Chand Publication, Delhi.
3. Goon, Gupta & das Gupta: Fundamentals of Statistics Vol II, Calcutta: The world press.

MSBC-CC-201

NUTRITION:

Course Objective:

- The paper provides the structural and functional role of cell organelles and cell membrane at the biological level.
- Students will be exposed classification, biochemical and required quantities of nutrients in diet.
- It helps students to understand the nutritive roles of macro and micronutrients

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hts/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit 1

Food Chemistry and Food & Nutrition, Introduction to Food and Nutrition, Human Nutrition, Public Health, and Nutrition, Maternal and Child Health, Nutritional Biochemistry

Unit 2

Immune boosting foods, Balanced Diet, Effects of Fasting, Brest feeding, Feeding and Obesity, Malnutrition, Nutrition and disease management

Unit 3

Transport of glucose across various cells, Cellular metabolism of carbohydrates, Glycogen metabolism, Regulation of carbohydrate metabolism at substrate level, enzyme level, hormonal level and organ level, Disorders of carbohydrate metabolism, Definition, classification, structure and properties of glycoprotein & Proteoglycans

Unit 4

Food Microbiology, Food Quality and Analysis, Industrial Management and Facility Planning, Food Science and Food Preservation

Practical in NUTRITION: MSBC-CC-201-P

1.Identification of Mono, Di and polysaccharides

2 .Identification of Proteins

3 .Identification of glycerol

4. Determination of pulse rate in Resting condition and after exercise (30 beats/10 beats method)

5. Determination of blood pressure by Sphygmomanometer (Auscultatory method).

6. Measurement of Peak Expiratory flow rate.

7. Determination of Bleeding Time (BT) and Clotting Time (CT).

8. Detection of Blood group (Slide method).

9. Measurement of Haemoglobin level (Sahli`s or Drabkinmethod

10. Planning and preparation of low cost diet for Grade I and Grade II malnourished child

Course Outcome:

1. Upon completion of this program the student should be able to: Understanding, critically assessing and knowing how to use and apply information sources related to nutrition, food, lifestyle and health. Identifying and classifying food and foodstuffs.

2. Being familiar with nutrients, their function in an organism, bioavailability, requirements and recommended quantities, as well as the bases of energetic and nutritional balance.

3. Interpreting and using food composition tables and databases properly.

4. Understanding the microbiology, parasitology and toxicology of food.

Recommended Books:

1. Gentle Nutrition: A Non-Diet Approach to Healthy Eating Paperback, 2021 by Rachael Hartley (Author), Victory Belt Publishing, New York

2. How Not to Die: Discover the Foods Scientifically Proven to Prevent and Reverse Disease Hardcover 2015 by Michael Greger M.D. FACLM (Author), Gene Stone (Author)

MSBC-CC-202

GENERAL BIOCHEMISTRY:

Course Objective:

1. To give students a solid foundation in biology and chemistry.

2. To develop analytical and critical-thinking skills that allows independent exploration of biological phenomena through the scientific method.

3. To introduce students to modern methods of biochemical experimentation within the disciplines of biology and chemistry.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hts/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit 1

Molecules of Life, Cellular and chemical foundations of life, Water Unique properties, weak interactions in aqueous systems, ionization of water, buffers, water as a reactant and fitness of the aqueous environment, Carbohydrates and glycobiology, Monosaccharides - structure of aldoses and ketoses, ring structure of sugars, conformations of sugars,

Unit 2

Mutarotation, anomers, epimers and enantiomers, structure of biologically important sugar derivatives, oxidation of sugars.Formation of disaccharides, reducing and non- reducing disaccharides. Polysaccharides – homo- and heteropolysaccharides,

Unit 3

Structural and storage polysaccharides.Structure and role of proteoglycans, glycoproteins and glycolipids Introduction to amino acids, peptides and proteins, Definition, classification & structures.Physico-chemical properties of amino, acids(amphoteric molecules, ionisation, zwitterions, pk values, isoelectric point, Lambert-Beer's law, optical density, absorption spectra),

Unit 4

Titration of amino acids (glycine, glutamic acid, lysine, histidine), Formol titration of glycine (only reaction and principle), reaction of amino acids, Peptides & Proteins, Lipids, Nucleic acids

List of Practical: (General Biochemistry): MSBC-CC-202

1. Separation of amino acids by thin layer chromatography.

2. Qualitative test for carbohydrate, lipid, amino acids & proteins.

3. Assay of proteins using Lowry method, standard curve preparation

4. SDS-PAGE analysis of proteins (BSA, Lysozyme, Ovalbumin)

Course Outcome:

Students completing the biochemistry course should be :

- Be able to frame a scientific question or problem.
- Be able to undertake investigations and perform analyses that provide information about biochemical questions and help to solve biochemical problems.
- Be able to demonstrate accurate quantitative analysis and computer literacy.
- Be able to communicate effectively, through writing and oral communication, the results of scientific investigations.
- Be able to understand and effectively apply scientific ethics.
- Be able to locate, obtain, read, and understand appropriate scientific literature.

Recommended Books:

1. Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning

2. Campbell, PN and Smith AD (2011) Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone

3. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman

4. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company

5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company,

6. Willey MJ, Sherwood, LM & Woolverton C J (2013) Prescott, Harley and Klein's Microbiology by. 9th Ed., McGrawHill 7. Voet,D. and Voet J.G (2004) Biochemistry 3rd edition, John Wiley and Sons,

MSBC-CC-203

Enzymology:

Course Objective:

To understand the kinetics and mechanisms of action of enzymes, to become familiar with the basic methods of studying enzymes, and to appreciate how individual reactions are controlled and integrated into the metabolic pathways of the cell. Acquired theoretical and experimental knowledge will enable students to find appropriate employment in different development, scientific-research laboratories, or to continue their further studies in biochemistry or related disciplines.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hts/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit 1

Enzymes as catalysts, proteins as catalyst, enzyme characteristics and properties, enzyme nomenclature/classification, Enzyme Purification and Assay

Unit 2

Enzyme kinetics, kinetics of single substrate reactions, kinetic concepts, enzyme kinetics, briggs-Haldane steady-state treatment, Michaelis constant (Km), specificity constant, single enzyme kinetics,

Unit 3

Enzyme inhibition, Multi-substrate reactions, Substrate binding analysis, Reaction Mechanisms and Catalysis, Active Site Investigations, Specific enzymes (alcohol dehydrogenase, ribonuclease A, triose phosphate isomerase, amino acyl tRNAsynthetases, carbonic anhydrase), Multi-substrate reactions, convention, mechanisms

Unit 4

ENZYME REGULATION, Partial Proteolysis, Phosphorylation, adenylylation, disulphide reduction, Allosteric regulation, sigmoidal kinetics, symmetry model, concerted model, kinetics and functions of allosteric enzymes, phosphofructokinase

Practical in Enzymology MSBC-CC-203-P

1. Extraction and preliminary purification of invertase from yeast
2. Assay for invertase activity
3. Ion-exchange chromatography (using DEAE-cellulose columns)
4. SDS-PAGE analysis
5. Kinetic analysis of invertase

Course Outcome:

Upon successful completion of this course, students should be able to: explain relationship between the structure and function of enzymes; explain how enzymes are able to increase speed of an biochemical reaction in sense of thermodynamics, kinetics and molecular interactions; use catalytic strategies in interpreting mechanisms of enzymatic action; interpret and explain significant mechanisms of regulation of enzymatic action and specifies importance of enzymes in regulation of metabolism; apply appropriate methods for determination of catalytic parameters and activity of enzymes and resolve problems considering kinetics and thermodynamics of enzymatic reactions; analyze options for applying enzymes and their inhibitors in medicine and various industries.

Recommended Books:

1. Enzymology by T. Devasena, Oxford University Press, 2010
2. Fundamentals of Enzymology by Nicholas C. Price, Lewis Stevens, OUP, 1989

MSBC-AE-201

Green Chemistry:

Course Objective:

To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Total Number of Hrs. : 30		**Theory**	**Practical**	**Tutorial**
Credits		**2**	**-**	**-**
Hrs/Week		**2**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 50				
Theory:50		**Practical: NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
30	**20**	**-**	**-**	

Unit 1

Introduction to Green Chemistry, Need for Green Chemistry, Goals of Green Chemistry, Limitations/ Obstacles in the pursuit of the goals of Green Chemistry, Principles of Green Chemistry, Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio-transformations - Production of Bulk and fine chemicals by microbial fermentation-Antibiotics – Vitamins, Future trends in Green Chemistry

Unit 2

Green house effect and Global Warming – Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of CO2 - Impact of green house effect on global climate - Control and remedial measures of green house effect -Global warming a serious threat - Important points. Acid rain

Unit 3

Energy resources & consumption; Fossil Fuel resources, Nuclear energy, Hydroelectric power, Renewable sources of energy, Wind Power, Solar photovoltics and solar ponds, Energy conservation strategies

Unit 4

Sustainable development, Remediation of pollutants, Pollution and its impact, Major laws on pollution, Environmental toxicology, Population explosion, Disasters and their management, National and international environmental issues, Environmental legislations, Cleaner technologies

Course Outcome:

- To understand the environmental status and evolution
- To know about the Pollution and its prevention measures
- To familiarise the green chemistry
- To learn about the bio-catalytic reactions
- To understand about the vitamins and antiobiotics
- To expertise the global warming and its effects
- To learn about the control and remedial measures of green house effect
- To know about the various analytical green m

Recommended Books:

1. V. Kumar, "An Introduction to Green Chemistry" Vishal publishing Co. Reprint Edition 2010
2. Rashmi Sanghi, M.M Srivastava "Green Chemistry" Fourth Reprint – 2009
3. Green Chemistry: Theory & Practice ,Oxford University.Press, New York,1998
4. Anastas, P.T. & Warner, J.K.: Green Chemistry - Theory and Practical, Oxford University Press (1998).
5. Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker (2001).
6. Cann, M.C. &Connely, M.E. Real-World cases in Green Chemistry, American Chemical Society, Washington (2000).
7. Textbook of Environmental Studies (Universities Press India Pvt. Ltd.)Erach Bharucha.
8. Environmental Science: A global concern (McGraw-Hill Education) William P Cunninggham, Mary Ann Cunninggham.

COURSE DETAILS

SUBJECT TITLE: Fundamentals of Yoga and Ayurveda

SUBJECT CODE: - MSBC-SE-201

TOTAL HOURS: 30 CREDITS: 2

Course Objectives

Objectives

1. Give an introduction of Yoga and its important streams.
2. Give a brief history and the basis different types of Yoga.
3. Understand the concept and principle underlying the Ayurveda medicinal system
4. Have knowledge & skills of therapeutics related to Tridosha system of disease and its treatment.
5. Dietary recommendation of Ayurveda with respect to seasons, behavior and others.

Total Number of Hrs. : 30		**Theory**	**Practical**	**Tutorial**
Credits		**2**	**-**	**-**
Hrs/Week		**2**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 50				
Theory:50		**Practical: NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
30	**20**	**-**	**-**	

Unit 1 General Introduction to Yoga [7Hrs.]

Brief introduction to origin of Yog**a** Psychological aspects leading to origin of Yoga, History and Development of Yoga; Etymology and Definitions of Yoga, Aim and Objectives of Yoga, Misconceptions about Yoga, True Nature of Yoga; General Introduction to Schools (Streams) of Yoga, Principles of Yoga and Yogic practices for healthy living, Patanjali Yoga.

Unit 2 Foundations of Yoga and Yoga Traditions [8Hrs.]

General introduction to Vedas and Upanishads, Yoga in Pre-vedic period, Yoga in Vedic period, Yoga in Ayurveda, Yoga in Principle Upanishads, Yoga in Yogopanishad; General introduction to Bhagavadgita, Yoga in Bhagavadgita; Introduction to Smritis and Yoga in Smritis, Introduction to Puranas, Nature of Yoga in BhagavatPurana ; Yoga in Yoga Vasishtha, Yoga in Narada Bhakti Sutra, Yoga in Medival Literature, Bhakti Yoga of Medival Saints, Yoga by Ramdev Ji and Parmahansa Yogananda Ji.

Unit 3 Fundamentals of Ayurveda [8 Hrs.]

Introduction of Ayurveda: Ayurveda and its Diversified Areas, AṣṭāngaĀyurveda: The Eight Branches of Āyurveda, Basic principal: Pañcamahābhūta (The Five Basic Elements), The Principle of Triḍoṣa: The Three Biological Humors, Traiyopastambha: Three Supporting Pillars of the Body, Saptadhātu: The Seven Fundamental Tissues, Ojas: The Vital Essence, Upadhātus: Sub-Tissues,

Tridaṇḍa: The Three Dimensions of Life - Body, Mind (Psyche) and Soul, PañcaPañcaka: The Five Pentads, Mala: Digestion and Metabolism, Prakṛti, Srotas: Body Channels, Acharya Balkrishna and Ayurveda.

Unit 4 Anatomy & physiology and DravyagunaVigyan [7 hours]

Basic introduction to Anatomy (Sareer Rachana) and Physiology (Sareer Kriya), *Rasa*: Taste: *Rasa (*taste) and the five elements, *Rasa* and *Doṣa, Rasa* and *Dhātu, Rasa* and *Mala,* Identifying *rasa* and their *guṇa-karma* (qualities and actions), *Guṇa*: Attributes, *Vīrya*: Potency, *Vipāka*: Post-Digestive Effect, *Prabhāva*: Specific Action

Course Outcome:

1. The course will provide deeper insight into the curriculum of Yogic Sciences along with the therapeutic applications of Yoga and alternative therapies.

2. Promoting Positive Health in the Student through Yoga and enabling and imparting skill in them to practice and apply Yogic practices for Health to general public and teach Yoga for Total personality development and spiritual evolution.

Suggested Reading

1. Acharya, B. (2004). AusadhDarshan. Haridwar, India: DivyaPrakashan.
2. Acharya, B. (2005). Ayurveda Jadi-butiRahasya. Haridwar, India: DivyaPrakashan.
3. Dasgupta S. N: History of Indian Philosophy, MotilalBanarsidas, Delhi, 2012.
4. Sharma, Chandradhar: A Critical Survey of Indian Philosophy. MotilalBanarasidas, Delhi, 2013.
5. Swami SatyanandaSaraswati: Gheranda Samhita, Pub: BSY Mungher.
6. Swami Kulvyananda: Hath Pradipika, Pub: Kaivalyadhama, Lonawala.
7. Yoga Darshan: Swami Ramdeva, Pub: DivyaPrakashan, Haridwar.
8. Patanjal Yoga Darshan: Geeta Press.
9. Swami Ramdev: Shrimad Bhagavadgita: Geetamrit, Pub: DivyaPrakashan.
10. Shrimad Bhagvadgita: Geeta Press.

MSBC-DS-201

Summer Internship

(Credit-2)

For the Summer Training and Internship program done in summer break during second semester, a certificate of completion is to be submitted along with the presentation in the department. In case a student is unable to do an internship in some company, he may do any one extra online skill enhancement course with a presentation in the department.

Molecular Biology (MSBC-CC-301)

Course objectives:

Molecular biology deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development. It is a large and ever-changing discipline. This course will emphasize the molecular mechanisms of DNA replication, repair, protein synthesis... etc.

Course Objective:

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hts/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit 1:

Basics of cell biology, Membrane structure and function, Structural organization and function of intracellular organelles, and Organization of genes and chromosomes.

Unit 2:

DNA replication, repair and recombination (Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination).

Unit 3:

RNA synthesis and processing (transcription factors and machinery, formation of initiation complex, transcription activator and repressor, RNA polymerases, capping, elongation, and termination, RNA processing, RNA editing, splicing, and polyadenylation, structure and function of different types of RNA, RNA transport).

Unit 4:

Protein synthesis and processing (Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors, Post-translational modification of proteins).

Unit 5:

Control of gene expression at transcription and translation level (regulating the expression of phages viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression, and gene silencing).

Course outcome:

At the end of this course, students should be able to demonstrate a clear understanding of the facts and basic concepts of molecular biology which are covered in lectures, including:

1. To provide the core principles of molecular biology.
2. To gain higher level thinking skills that are necessary for scientists.
3. This course should excite about basic science and its applications.

Suggested Readings

- Benjamin Lewin. 2007. Genes IX. Jones and Bartlett publishers, Inc.,
- Brown, T. A. 2007. Genome 3. Garland Science Publishing.
- Malacinski, G.M. 2007. Essentials of Molecular Biology (IV edn.) Jones and Bartlett Publishers,Inc.,
- Watson, J. D., T. A. Baker, S. P. Bell, A. Gann, M. Levine, R. Losic. 2006. (V edn.) MolecularBiology of the Gene. Pearson Education.
- Campbell, M. K., S. O. Farrel. 2007. Biochemistry. (V edn.) Baba Barkha Nath Printers. Delhi.

Practical Molecular Biology MSBC-CC-301-P

- Extraction of plasmid DNA from bacterial cell and electrophoresis in agarose gel.
- Restriction enzyme digestion and electrophoresis.
- Ligation and cloning in a plasmid vector
- Preparation of competent cells followed by transformation and calculation of transformation efficiency.
- PCR and analysis by agarose gel electrophoresis
- Blue white screening, restriction map Analysis.
- Expression and purification of the recombinant protein
- Multiple sequence alignment and Primer designing.

MSBC-CC-302 (Biotechnology)

Course Objectives:

- To understand principles of animal culture, media preparation.
- To explain *Invitro* fertilization and embryo transfer technology.
- To describe meristem culture and clonal propagation of plants on a commercial scale.
- To get insight in applications or recombinant DNA technology in agriculture, production of therapeutic proteins.
- To describe commercial production of fuels, microbial enzymes.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hts/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit I: Basic Biotechnology:- [10 hrs]

Principals of Biotechnology applied to plants and animals, Biotechnology application in the field of Agriculture, medicines, Antibiotic production, etc.

Unit II: Plant Biotechnology [**10 hrs]**

Scope and importance of Plant Biotech in crop improvement, Plant tissue culture technique(Culture media) Micro propagation, organogenesis, Microsporogenesis & Ovule culture.

Unit III Immunology [20 hrs]

Introduction & expectations of elements of Immunity, Innate immunity (classical & alternate), natural killer cells (NK CELL), Neutrophils, etc. Adaptive immunity & antibody structure, specificity and generation, immunoglobulins – structure, classification and functions. Idiotype network hypothesis. Antigen, types of antigen, antigen versus immunogens, Haptens. Factors influencing immune-genicity.Isotypes, allotypes and idiotypes. Overview of B cell & T cell, types of immune response, T – cell, B- cell receptors, Antigen recognition – processing and presentation to T- cells. Interaction of T and B cells. Effector mechanisms – macrophage activation. Cell mediated cytotoxicity, Cytokines types, regulation of immune response : immune tolerance and immune-suppression

Unit IV: Genetic Engineering [20hrs]

Introduction & problems of Genetic Engineering, cloning vector: characteristic of good vector, type, structure of different cloning vectors, Restriction and modification enzymes. Cloning vectors: Characteristics, Natural &artificial plasmids as vectors - advantages and disadvantages. Vectors used

for cloning in E.coli., yeast, higher plants (Ti plasmid derivatives, caulimovirus) and animal cells (constructs of SV 40 and retroviruses). Characteristics of expression vectors. Construction of DNA libraries - genomic and cDNA libraries. Screening of recombinants. formation of hybrid DNA through genetic engineering , Gene library and cloning of foreign gene, confirmation of transgene expression, positive and negative gene expression, gene expression of somatic gene hybrid, Polymerase chain reaction – principle, types and applications. Sanger's and Maxam-Gilbert's method for DNA sequencing. DNA Fingerprinting - RAPD, RACE, RFLP and AFLP analysis and its application in forensic science, Ex-*vivo, Invivo, Insitu* gene therapy Strategies of gene therapy.

Course Outcome:

The course covers the fundamentals of genome, gene cloning and gene transfer techniques.

• Students will understand the general plant tissues culture technique along gene therapy strategies.

• Students will understand the basic molecular techniques and techniques involved in the field offorensics.

• The course also covers the humam genome project and biosafety levels which enables the students to acquire good laboratory practices

Reference Books

1. Molecular Cloning: A Laboratory manual, J. Sambrook, E.Frisch and T. Maniatis, Old Spring Harbor Laboratory Press New York, 2000
2. Molecular and Cellular methods in Biology and Medicine. PB Kaufman,W.Wu.D Kim and LJ Cseke, CRC
3. DNA Science. A first Course in Recombinant Technology, DA Mickloss and GA Freyer, Cold Spring Harbour Laboratory Press, New York 1990
4. Plant Biotechnology: The Genetic Manipulation of Plants" by Slater.
5. Introduction to Plant Biotechnology by Chawla H S.
6. Cooper G. M. Hausman R. E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press and Sunderland, Washington D. C.; Sinnauer Academic Press.
7. Becker W. M., Kleinsmith L.J. and Bertni G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San fransisco.
8. Transgenic Crops III (Biotechnology in Agriculture and Forestry) by Y P S Bajaj
9. Practical Book of Biotech and Plant Tissue Culture, Author: Madhavi Adhav & Santosh Nagar.

Practical MSBC-CC-302-P

1. To carry out the spectrophotometric analysis of genomic DNA.
2. Agarose gel electrophoresis.
3. To identify lipids in a given sample by thin layer chromatography.
4. To separate amino acid mixture by paper chromatography.
5. Isolation of Plasmid DNA.
6. Digestion of plasmid with three different restriction enzymes.
7. Quantitative analysis of total soluble sugar from plant tissue.
8. Quantitative analysis of secondary metabolites.
9. Preparation of new plant species through Plant tissue culture.

MSBC-CC-303 (Microbiology)

Objective: To impart knowledge of the basic principles of microbiology including bacteriology, virology, mycology and parasitology. Also understanding the nature of pathogenic microorganisms, pathogenesis, laboratory diagnosis, transmission, prevention and control of diseases common in society.

Course Objective:

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hrs/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit-1

Introduction of Microbiology: Origin and evolution of microbial world; Pathway of discoveryin Microbiology; Haeckel's three kingdom concept, Whittaker's five kingdom concept, threedomain concepts of Carl Woese, Classification and bacterial and archaea systematics:conventional and modern methods of bacterial taxonomy. Classification of bacteria according toBergey's manual, bacterial identification, general characteristics of archaea, eubacteria, acellularlife forms.

Unit-2

Prokaryotic and Eukaryotic Microbiology: General characteristics of various groups of prokaryotes: bacteria including, Rickettsiae, Chlamydiae, Spirochaetes and Actinobacteria, Cyanobacteria and Mycoplasmas. Microbes Growth: Definition of growth, mathematical expression of growth, growth curve, diauxic & synchronous growth, continuous culture. Effect of environmental on bacterial growth.

Unit-3

Eubacteria: cell structure, nutrition, isolation and cultivation. Diversity, nutrition, ecology,significance of gram-positive (Firmicutes, Actinobacteria) and gram-negative [Proteobacteria (cyanobacteria, Rhizobia), Deinococcus-Thermus, Spirochaetes, Bacteroidetes].Mycology and phycology: General characters of fungi and algae, cultivation, cultural characteristics, microscopic morphology, importance of fungi and algae in industry and food production. Yeasts: General characteristic, structure, classification, life cycles (important forms), sexual and asexual reproduction of yeast (Saccharomyces cerevisiae).

Unit-4

Virology- Structure of animal viruses and plant viruses; satellite viruses; viroids; prions; diseases caused by animal viruses and plant viruses, genome organization of animal viruses; genome organization of DNA and RNA plant viruses, bacteriophages, lytic and lysogenic cycles, cultivation of viruses, diagnosis viruses

Unit-5

Protozoa: Classification, morphology, reproduction, modes of nutrition, modes of transmission, life cycle, cultivation of protozoa. Structure and significance: Entamoeba, Plasmodium.Applied Microbiology- Overview of applications of microorganisms in Agriculture, Environment, Food, Industry and Medical Sciences.

Course Outcome:

After studying the course the student should appreciate how Microbiology has helped to treat and prevent diseases which are caused by viruses, bacteria, protozoa and fungi. In medicine, for example, microbiology led to the discovery and development of: Antibiotics, and. Vaccines.Students will obtain and demonstrate capability in laboratory procedures and in routine specialized microbiological laboratory skills applicable to microbiological research or clinical methods, including accurately reporting observations and analysis.

Books recommended:

- Michael J Pelczar, Microbiology, Tata McGraw, India.
- Microbiology by Stuart Walker, W B Saunders
- Principles of Virology: Molecular Biology, Pathogenesis, and Control of Animal Viruses. S. J. Flint, V. R. Racaniello, L. W. Enquist, V. R. Rancaniello, A. M. Skalka.

MSBC-CC-303-P Practical:

- Sterilization, disinfection, safety in microbiological laboratory
- Preparation of media (plates, broth and slants) for growth of various microorganisms.
- Identification and culturing of various microorganisms.
- Spreading and streaking plating techniques.
- Staining of bacteria – Simple staining, differential staining, staining of spores and capsules Enumeration of microorganisms from water by viable plate counting
- Determination of growth curve of bacteria and calculation of bacterial population by turbidometry
- Effect of pH, temperature and UV irradiation in bacterial growth
- Determination of Minimal Inhibitory concentrations (MIC) for kanamycin and ampicillin against Bacteria.

MSBC-SE-301

MOOC-1

Credit:2

List of MOOC courses shall be decided by the departmental committee depending upon the list from SWAYAM/NPTEL and other recognized online platforms. Students have to study from Online Platform Exams shall be taken by university. If a student wishes he can give exam of Online Platform for certification. SWAYAM courses can be seen in the website https://swayam.gov.in/.

MSBC-CC-401 (Bioinformatics)

Course Objectives:

The main goals of Bioinformatics course is:

(1) to manage biological data in such a way that it allows easy access to the existing information and to submit new entries as they are produced;

(2) to develop technological tools that help analyze biological data; and

(3) to use these tools to analyze the data and interpret the results from a biological perspective.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hts/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit:1

Conformations of peptide and proteins (primary, secondary, tertiary and Quaternary), alpha helix, Turns (beta, alpha, gamma etc.), Ramachandran plot, protein folds and motifs, domains and prokaryotes and mammalian molecular chaperons, Structure of globular and fibrous proteins, unnatural amino acids and peptides, intrinsically disorder proteins.

Unit:2

Study of different databases, Protein and Gene Information Resources PIR, SWISSPROT, PDB, Genebank, multiple sequence alignment, phylogenetic clustering.

Unit:3

Analysis, protein modelling (homology modelling, threading and ab initio prediction), Identification of drug targets, Molecular docking (Rigid docking, flexible docking), docking based screening.

Unit:4

Preparation of ligand and receptor for docking, lead discovery, lead optimization, combinatorial library, force fields, molecular energy minimization, molecular dynamics simulation.

Unit:5

Quantitative Structure Activity Relationship (QSAR), ADMET studies, 3D pharmacophore, Pharmacokinetics, pharmacogenomics, chemoinformatics, ayurinformatics and chemogenomics.

Course Outcomes:

- To get introduced to the basic concepts of Bioinformatics and its significance in Biological data analysis.
- Describe the history, scope and importance of Bioinformatics and role of internet in Bioinformatics.
- Explain about the methods to characterize and manage the different types of Biological data.
- Classify different types of Biological Databases.
- Introduction to the basics of sequence alignment and analysis.
- Overview about biological macromolecular structures and structure prediction methods.

Books recommended:

- Introduction to bioinformatics, Arthur M. Lesk, 2002
- Jack Kyte , Structure in Protein Chemistry , Garland Science, 2007.
- Bioinformatics and Functional Genomics, 3rd Edition | Wiley
- A. Kessel and Nir Ben-Tal, Introduction to Proteins-Structure, function and motion, CRC press, Taylor and Francis, 2011.
- Georg E. Schulz, R. HeinerSchirmer, Principles of protein structure, Springer, 1998

MSBC-CC-401-P Practical Bioinformatics

- Orientation to Bioinformatics servers, Retrieval of sequence from databases-NCBI,EMBL.
- Retrieval of protein tertiary structure- PDB.
- BLAST exercises and Variants of BLAST. Sequence alignment-Pairwise and multiple sequence alignment.
- Visualization of structures- PyMOL.
- Protein structure prediction- Homology modeling.
- Docking of protein and ligand.
- Exposure to analysis tools for DNA and proteinsequences.

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MSBC-CC-402 (Biochemistry of Diseases)

Course Objective: To create general awareness among students about the various diseases associated with lifestyle and which could be prevented by managing day-to-day life style.

Course Objective:

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hts/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit-1

Introduction to Healthy Lifestyle Life style, food habits, healthy habits, exercise and unhealthy habits (brief description only). Basic biochemistry (Biomolecules- carbohydrates, lipids, proteins, nucleic acids, vitamins, minerals – brief outline).

Unit-2

Diabetes mellitus and Obesity Diabetes mellitus: classification (type 1, type 2, gestational- brief description only), symptoms (polyuria, polydipsia, polyphagia), causes, diagnosis (GTT, glycated hemoglobin- brief description only), management (diet, exercise, drugs). Obesity: classification according to BMI (brief description), symptoms, causes, diagnosis, treatment and management.

Unit- 3

Cancer Types of cancer, benign and malignant tumor, metastasis (definition), causes, diagnosis (screening, blood tests, X-rays, CT scans & endoscopy - brief description only), prevention (dietary, medication, vaccination, screening- outline only), treatment and management (surgery, chemotherapy, radiation, palliative care).

Unit- 4

Nephritis Function of kidney (brief outline), GFR, nephritis (definition), causes, symptoms, diagnosis (kidney function test - brief outline of serum and urine creatinine, blood and urine urea, BUN, clearance test creatinine and urea), treatment, management (dialysis- peritoneal and hemodialysis). Module VI (7hrs) Liver disease 62 Function of liver (brief outline), liver disease (viral hepatitis, alcoholic liver disease, and cirrhosis), symptoms, causes, diagnosis (liver function test- brief outline of serum bilirubin, serum albumin, serum alkaline phosphatase, ALT, AST and LDH), treatment and management.

Unit-5

Atherosclerosis, Hypertension and Stroke Atherosclerosis: characteristics, causes (confirmed & indirect risk factors – brief description only), ischemia, myocardial infarction (definition), diagnosis (electrocardiography, exercise stress test, echocardiography, coronary angiography, intravascular ultrasound, magnetic resonance imaging – brief description only), prevention (lifestyle, diet, drugs), management (drugs, angioplasty, stenting, bypass surgery- brief description only) Hypertension: characteristics, Causes, Diagnosis, Prevention and Management (brief description only) Stroke: characteristics (ischemic and hemorrhagic), causes, diagnosis (neurological examination, scanning - brief description only), management (drugs, mechanical thrombectomy, angioplasty and stenting - brief description only).

Course outcome:

Student will be able to

(1) Enumerate the different causes and risk factors of life style diseases like atherosclerosis, hypertension, stroke, diabetes, obesity, nephritis and liver diseases.

(2) List out the methods to diagnose the diseases and gain a basic knowledge regarding interpretation of the test results.

(3) Spell out the methods of prevention, treatment and management of the diseases.

(4) Identify healthy and unhealthy life habits and adopt better life style.

Suggested reading:

- Guide to Prevention of Lifestyle Diseases by R. Kumar (Author), M. Kumar (Author), Deep & Deep Publications, ISBN-13: 978-8176295185.
- Textbook of Medical Biochemistry for Medical Students by DM Vasudevan and SreeKumari S. 5th edition, Jaypee Brothers, Medical Publishers, ISBN 81-8448-124-1:9788184481242.
- Biochemistry – U. Satyanarayana, U. Chakrapani, third edition, ISBN 81-87134-80-1
- Textbook of Medical Physiology, by Arthur C Guyton, John E Hall Prism Saunders 9th Edition ISBN: 81-7286-034-X.

Biochemistry of Diseases Practical MSBC-CC-402-P

1. To check the blood glucose level before and after fasting
2. To check the blood clotting through small capillary tube
3. Bilirubin test through Van den Bergh method
4. To check the components of urine of a healthy person
5. Liver function test
6. Kidney function test

MSBC-CC-403 Physiology (Plant)

Course Objectives:

1. This course is designed to survey contemporary aspects of plant physiology with emphasis on recent research progress in related fields. Topics covered plant water relations water transport, mineral nutrition, carbon and nitrogen metabolism (photosynthesis, respiration, and N assimilation), plant growth and development.

2. An understanding of the biology of plants has implications for our ability to address applied questions and issues facing our world today such as agricultural concerns, handling threatened species and habitats, and global changes and increased appreciation for plants as fascinating and important components of our living world.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**2**	**-**
Hts/Week		**4**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 150				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**35**	**15**	

Unit-1

Photosynthesis - Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms; CO2 fixation-C3, C4 and CAM pathways, Respiration and photorespiration – Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway.

Unit-2

Nitrogen metabolism - Nitrate and ammonium assimilation; amino acid biosynthesis. Plant hormones – Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action.

Unit-3

Sensory photobiology - Structure, function, and mechanisms of action of phytochromes, cryptochromes and phototropin; stomatal movement; photoperiodism and biological clocks.

Unit-4

Solute transport and photoassimilate translocation – uptake, transport,and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photo-assimilates.

Unit-5

Secondary metabolites - Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles. Stress physiology – Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses.

Course Outcomes:

1. The student knows and understands the physiological processes taking place at the level of the cell, organ and the whole plant, and recognizes the influence of environmental factors on the functioning of plant organisms.

2. Student knows and understands professional terms and terminology used in natural sciences and uses them together with mathematical and statistical methods to describe and interpret physiological processes.

3. Student knows and understands the relationship of plant physiology with other natural sciences, and gives examples of modification of physiological processes with the use of biotechnological tools.

Recommended books

- Introduction of Plant Biochemistry, by Goodwin T. W. and E.I. Mercer, Pergamon Press, Oxford, 1983.
- Plant Physiology, 5th Edition, by Lincoln Taiz and Eduardo Zeiger, Amazon press, 2012
- Introduction of Plant Biochemistry, by Goodwin T. W. and E.I. Mercer, Pergamon Press, Oxford.
- Buchanan BB, Gruissem W & Jones RL. 2000. Biochemistry and Molecular Biology of Plants. 2nd Ed. John Wiley.
- Dey PM &Harborne JB. 1997. Plant Biochemistry. Academic Press.
- Heldt HS. 1997. Plant Biochemistry and Molecular Biology. Oxford Univ.Press.

Practical Physiology (Plant) MSBC-CC-403-P

- Osmosis and endosmosis.
- Slides of different organ of plant including TS and VS.
- Estimation of total chlorophyll, chlorophyll a and chlorophyll b pigments firm the leaves.
- Estimation of starch content.
- Spectrophotometric estimation of Indole acetic acid in plant tissues.
- Estimation of carotene, ascorbic acid, phenols and tannins in fruits and vegetables.

University of Patanjali, Haridwar

Skill Enhancement Course

COURSE DETAILS

COURSE CODE: MSBC-SE-401

SUBJECT TITLE: Herbal Drug Development

TOTAL HOURS: 30 CREDITS: 2

Course Objectives:

1. Helping learners to understand General aspect of medicinal plants.
2. To understand various methods of preparation and standardization of herbs.
3. The students will understand the concept of herbal formulation.
4. The students will understand the basic idea of herbal cosmetics too.

Total Number of Hrs. : 30		**Theory**	**Practical**	**Tutorial**
Credits		**2**	**-**	**-**
Hrs/Week		**2**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 50				
Theory:50		**Practical: NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
30	**20**	**-**	**-**	

HERBAL DRUG DEVELOPMENT

UNIT 1 GENERAL METHODS OF PROCESSING OF HERBS:
Definition, sources, identification and authentication of herbs. Different methods of processing of herbs like collection, harvesting, garbling, packing and storage conditions. Methods of drying – Natural and artificial drying methods with their merits and demerits.

UNIT II METHODS OF PREPARATION AND STANDARDIZATION OFHERBAL RAW MATERIALS AND EXTRACTS
Principles of extraction and selection of suitable extraction method with their merits and demerits. Standardization of herbal raw materials including Pharmacological, physical, chemical and biological methods with examples

UNIT III.ISOLATION AND ESTIMATION OF PHYTOCONSTITUENTS
Different methods (including industrial) for isolation and estimation of phytoconstituents from the following drugs (with special emphasis on HPLC and HPTLC).Alicin from Garlic.Piperine from Piper nigram / Piper longum.Bacosides from Bacopamonnier.Berberine from Berberisaristata.

UNIT IV HERBAL FORMULATION DEVELOPMENT:
Selection of herbal ingredients. Different dosage forms of herbal drugs. Evaluation of different dosage forms. Stability studies of herbal formulations

UNIT V HERBAL COSMETICS

Cosmetics preparations: Incorporating the herbal extracts in various cosmetic formulations like Skin care preparations (Creams and Lotions), Sunscreens and Sunburn applications, Hair care preparations (Hair oils and Hair shampoos) and Beautifying preparations(Lipsticks, Face powders and Nail polish).

Course Outcomes:

1. The detail understanding of medicinal properties of various herbs.
2. To understand various chemical methods for the preparation and standardization of herbal drugs.
3. In hand practical knowledge of herbal formulation.
4. In hand practical knowledge of herbal cosmetics too.

Text Books

- Herbal drug industry by R.D. Choudhary, Ist edition, eastern publisher, New Delhi: 1996.
- GMP for Botanicals - Regulatory and Quality issues on Phytomedicine Business horizons, New Delhi, First edition, 2003. Robert Verpoorte,
Pulok K Mukharjee.
- Indian Herbal Pharmacopoeia, Vol.1 & 2, RRL, 1DMA, 1998, 2000.
- Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae, 4th edition, Nirali Prakashan, 1996.
- Text book of Pharmacognosy and Phytochemistry by rangare.
- Biological standardization by J.N.Barn, D.J.Finley and L.G. Good win

References

- Herbal Cosmetics - H.Pande, Asia Pacific Business press, New Delhi.
- H.Pande, “The complete technology book on herbal perfumes and cosmetics”, National Institute of Industrial Research, Delhi.
- Quality control of herbal drugs by Pulok K Mukarjee, Ist edition, Business horizons Pharmaceutical publisher, New Delhi, 2002.
- PDR for herbal medicines, 2nd edition, medicinal economic company, New Jersey, 2000.
- Plant drug analysis 2nd edition by Wagner, Bladt

MSBC-DS-401

(Credit-4)

Dissertation

Course Objective:

This course is focused to facilitate student to carry out basic research and development project through problem and gap identification, development of methodology for problem solving, interpretation of findings, presentation of results and discussion of findings. The overall goal of the dissertation is for the student to display the knowledge and capability required for independent research work.

Credits	**4**		
SCHEME OF EXAMINATION			
Total marks: 100			

Course Outcome:

The student will be able to

• gain in-depth knowledge and use adequate methods in the major subject/field of study.

• create, analyze and critically evaluate different research solutions

• clearly present and discuss the conclusions as well as the knowledge and arguments that form the basis for these findings

• identify the issues that must be addressed within the framework of the specific dissertation in order to take into consideration

Post Graduate Diploma in Yoga Science

Preamble

Ayurveda and ***Yoga*** are indispensable components of the *Vedic* tradition**.** Incorporating*Ayurvedain our daily activities* healsbody and mind and body whereas *Yoga* unleashes ones' superior mental faculties. These two sciences are interconnected through the vital energy called *Prana*: of which *Yoga* is for higher evolutionary transformations, and*Ayurveda* is its healing power. Together they form a common system of self-improvement, self-control, and self-rejuvenation.

Both *Yoga* and *Ayurveda* are based on the principles of *Trigunas(Sattva, Rajas and Tamas)* and the five basic elements,*Panchamahabhuthas*(Earth, Air, Fire, Water, Space). Theycomprehend how the human body works (*Doshas-Dhatu-Mala* / humor-tissue-waste material theory) i.e. human physiology, and how food and medicine have effect on the body. Both acknowledge that a healthy body is vital for fulfilling the four aims of life: *Dharma* (duty), *Artha* (wealth), *Kama* (desire) and *Moksha* (liberation).

I. Title of the Program The program shall be called Post GraduateDiploma in Yoga Science& Ayurveda"

II. Aim of the Program The aim of the program is to produce Yogaprofessionals with adequate knowledge of ayurvedafor academic & therapeutic fields

III. Objectives of the programme

Deeper Understanding of Yoga& Ayurveda: To make students understand the classicalnature of Yoga &Ayurveda giving them the in-depth knowledge of their various components.
Prevention: To introduce yoga as therapy, its principles and practices of yogafor prevention of various lifestyles, non-communicable and psychosomaticdisorders. In addition the knowledge of Ayurveda gives the healing touch and can prevent the various life threatening diseases.
Promotion of positive health: To prepare them for giving talks and offertechniques to promote healthy yogic life style with healing touch.

IV . Duration

Duration of the course will be 1 year (2 semesters)

Structure of Post graduate diploma of Yoga and Ayurveda

Scheme of Teaching & Examination

S.N.	Subject Code	Subject Title	Periods per week			Evaluation Scheme				Subject Total
						Seasonal			SEE	
			L	T	P	Credit	CT	TA		
I Year										
Semester I										
1	PGDYA-CT-101	Basics of Yoga	3	1	0	4	20	10	70	100
2	PGDYA-CT-102	Principles of Ayurveda	3	1	0	4	20	10	70	100
3	PGDYA-CT-103	Human Biology	3	1	0	4	20	10	70	100
4	PGDYA-CT-104	Pharmacotherapeutical Science	3	1	0	4	20	10	70	100
5	PGDYA-CT-105	Diet and nutrition	3	1	0	4	20	10	70	100
6	PGDYA-CT-106	Yoga Practicum	0	0	8	4	20	10	70	100
7	PGDYA-CT-107	Ayurveda Practicum	0	0	4	2	10	05	35	50
32Hrs						**26**	**Total**			**650**
Semester II										
1	PGDYA-CT-201	Yoga & Nature Cure	3	1	0	4	20	10	70	100
2	PGDYA-CT-202	Complementary & Alternative Therapy (CAT)	3	1	0	4	20	10	70	100
3	PGDYA-CT-203	Important Medicinal herbs	3	1	0	4	20	10	70	100
4	PGDYA-CT-204	Basics of Healthy Living	3	1	0	4	20	10	70	100
	PGDYA-CT-205	Disease specific pathology	3	1	0	4	20	10	70	100
5	PGDYA-CT-206	Yoga Practicum	0	0	8	4	20	10	70	100
6	PGDYA-CT-207	Pathology Practicum	0	0	4	2	10	5	35	50
7	PGDYA-CT-208	Project work	0	0	4	2	10	5	35	50
36hrs						**28**	**Total**			**700**
Total number of Credits						**54**	**Total Marks**			**1350**

COURSE DETAILS
SUBJECT TITLE: Basics of Yoga
SUBJECT CODE: - PGDYA-CT 101
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4
Course objectives:

The teaching-learning of this paper will enable learner to-

1. Deeper Understanding of Yoga: To make students understand the classical nature of Yoga & giving them the in-depth knowledge of its various components.
2. Prevention: To introduce yoga as therapy, its principles and practices of yoga for prevention of various lifestyles, non-communicable and psychosomatic disorders.
3. Promotion of positive health: To prepare them for giving talks and offer techniques to promote healthy yogic life style.

Course Outcomes:

1. The students will well understand the various concept of yoga in day to day life using various asanas, kriyas and pranayam.
2. Students will understand the vedic concept of the yoga and learn the various concept written in ancient books like Vedasand Upanishads,YogainPre-vedicperiod,YogainVedic period,YogainAyurveda. In addition, they will get the knowledge of YogainYogapanishad and Bhagavadgita.
2. The students will develop the concept of yoga to deal with the various life threating diseases.
3. Students will get training in wellness center and will directly interact with patients and develop the skill to treat them with yogic concept.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**-**	**-**
Hts/Week		**4**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**-**	**-**	

UNIT1:GeneralIntroductiontoYoga[12Hrs.]

BriefintroductiontooriginofYogaPsychological aspectsleadingtoorigin ofYoga,History andDevelopmentofYoga;Etymologyand DefinitionsofYoga.Aim andObjectivesofYoga, MisconceptionsaboutYoga,TrueNatureofYoga;GeneralLntroduction.toSchools(Streams) of Yoga, Principles ofYogaand Yogicpractices forhealthy living.

UNIT2:FoundationsofYogaandYogaTraditions[15H_rs.]

General introductiontoVedasand Upanishads,YogainPre-vedicperiod,YogainVedic

period,YogainAyurveda.YogainPrincipleUpanishads,YogainYogopanishad;General introductiontoBhagavadgita,YogainBhagavadgita;IntroductiontoSmritisand Yogain Smritis.IntroductiontoPuranas,NatureofYogainBhagavatPurana;YogainYogaVasishtha, YogainNaradaBhaktiSutra,YogainMedival Literature, Bhakti YogaofMedival Saints.

Unit3:GeneralintroductiontoIndianphilosophy [12Hrs.]

Philosophy: meaning, definitions and scope; Indian Philosophy: Salient features, Branches (AstikaandNastikaDarshanas),DistinctionfromReligion andScience,Briefintroduction to Prasthanatrayeeand PurusharthaChatushtaya;Relationship between Yoga and Indian Philosophy.

Unit4:GeneralintroductionofPatanjaliYogaSutraandHatbaYoga[15Hrs.]

Concept ofCitta, CittaBhoomi, CittaVritti, Nidodhupaya(Abhayas&Vairagya), Concept of lshwar, CinaVikshepas, Types ofSamadhi, PanchaKlesh, Dukhavada, KriyaYoga, AshtangaYoga,TypesofKarma,VivekJnanaNirupanam,KaivalyaNirvachana;Meaning andDefinition of Hatha yoga, Tradition of Hatha Yoga, Purpose of Hath yoga, Qualities of Hatha Siddhi, Sadhak- Badhaktattva, Concept of Mitahara, Concept of Yogic Diet, Seasonal Description, Shatkanna, Asana and Pranayam.

Unit5:ConceptandImplicationsofImportantYogicStreams[6Hrs.]

JnanaYoga,BhaktiYoga, KarmaYoga,HathaYoga,Raj Yoga.

Text Books

1.DasguptaS.N:HistoryofIndianPhilosophy,MotilalBanarsidas,Delhi,2012.
2. Sharma,Chandradhar: ACritical Survey ofIndian Philosophy.MotilalBanarasi das, Delhi, 2013.
3. SwamiSatyanandaSaraswati:GherandaSamhita,Pub: BSYMungher.
4. SwamiKulvyananda:HathPradipika,Pub:Kaivalyadhama,Lonawala.
5. Yoga Darshan:SwamiRamdeva,Pub:DivyaPrakashan,Haridwar.
6.PatanjalYoga Darshan:GeetaPress.
7. SwamiRamdev:ShrimadBhagavadgita:Geetamrit,Pub:DivyaPrakashan.
8. ShrimadBhagvadgita:GeetaPress.

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COURSE DETAILS
SUBJECT TITLE: Principles of Ayurveda
SUBJECT CODE: - PGDYA-CT 102
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4

Course objectives:

The teaching-learning of this paper will enable learner to-

1) State concept, prevalence, objectives, types, applications and limitations of various ayurvedic concepts.

2) Have knowledge of ayurveda to treat various diseases such as diabetes, blood pressure, cancer, skin disorders etcand also develop the concept of Pancamahabhuta too.

3. Students will also learn the various concept of Astanga Ayurveda,Pancamahabhuta, Tridosa andvarious other concept of Ayurveda.

Course Outcomes:

1. The students will well understand the various concept of ayurveda in day to day life get learn the how to deal with various diseases using ayurveda.
2. The students will develop basic understanding of ayurveda and its practical application too.
3. Students will get hand on training in wellness center and directly interact with patients and develop the skill of it and can open their own center.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**-**	**-**
Hts/Week		**4**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**-**	**-**	

Unit1:FundamentalsofAyurveda[20Hrs.]

Introduction of Ayurveda:Ayurveda and its DiversifiedAreas, Astanga Ayurveda:The Eight Branches of AyurvedaBasicprincipal:Pancamahabhuta(TheFiveBasicElements),ThePrincipleofTridosa:The Three BiologicalHumors, Traiyopastambha:Three Supporting Pillars of the Body, Saptadhatu: The SevenFundamental Tissues, Ojas: The Vital Essence,Upadhatus: Sub-Tissues, Tridana: The Three Dimensions of Life -Body, Mind(Psyche) and Soul,PancaPancaka:TheFive Pentads, Mala: Digestionand Metabolism, Prakrti, Srotas: Body Channels

Unit2:SareerRachana(Anatomy)andSareerKriya(Physiology)Vigyan[10hour]

Unit 3: DravyagunaVigyan [20 hour]

Rasa: Taste:Rasa (taste)andthefiveelements,*Rasa*and *Dosa, Rasa*and*Dhatu,Rasa*and *Mala,*Identifying*rasa*andtheir*guna-karma* (qualitiesandactions),*Guna:*Attributes,*Virya;* Potency*Vipaka:*Post-DigestiveEffect,*Prabhava:*SpecificAction

Text Books

1. Acharya,B.(2004). AusadhDarshan.Haridwar, India:DivyaPrakashan.

2. Acharya,B.(2005).AyurvcdaJadi-butiRahasya.Haridwar,lndia:DivyaPrakashan.

Book s of References

1. Holford,P.&Burne,J.(2007).foodisbettermedicinethandrugs.GreatBritain:Piatkus.

2. Holford,P.(2014).GoodMedicine. GreatBritain:Piatkus.

3. Mohan,H.(2010).Textbookofpathology(6thed.).NewDelhi,India;JAYPEEBROTHERS MEDICAL PUBUSHERS (P) LTD.

4. Sharma,S.(2013).ChikitsaUpcharKeVividhAyam (2nd ed.). Mathura, Jndia: AkhandJyotiSamsthan.

5. Sharma,S.(2013).NirogJeevanKeMahatopurnaSutra(2nded.).Malhura,India: AkhandJyotiSamsthan.

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COURSE DETAILS
SUBJECT TITLE: Human Biology
SUBJECT CODE: - PGDYA-CT 103
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4
Course objectives:

The teaching-learning of this paper will enable learner to-

1.Discuss & introduce main human body systems.

2. Discuss anatomical & physiological effects of selected yoga practices on human body systems in evidence based way.

Course Outcomes:

1. The students will well understand the various concepts of Anatomyand physiology.
2. The students will understand the functioning of various body systems and related diseases.
3. Students will get training in wellness center and will directly interact with patients and understand about various disease related to human systems and learn their treatment using yoga and Ayurveda.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**-**	**-**
Hts/Week		**4**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**-**	**-**	

Unit 1:CellandTissue,MusculoSkeletalandDigestivesystem[20Hrs.]

Cell: Structure & Functions, different cell organelles and their functions; Tissues and Organization of human system; Musculo-Skeletal System: The SkeletalSystem: Skeleton,Functions of skeleton, Classification ofbones andjoints;TheMuscular System: structureandfunctions of differenttypesof

muscles;Digestivesystem:Mouth,Oralcavity,Pharynx,esophagus,Stomach,Large&smallintestine, anus;Associatedglands-Liver,Pancreas,salivaryglands,Basicphysiologyofdifferentstages of digestion, absorption and assimilation.

Unit2: Excretory, Respiratory and Cardiovascular System [15 Hrs]

Excretory System: Function and structure of Kidney, Urinary bladder and urethra;

Respirator System: Anatomy of the respiratory passages Nose, nasal cavity, pharynx,Trachea, Larynxbronchi, lung · processofRespiration, Lungvolumes&capacities, basicmechanicsof breathinand exchange of gases in alveoli;

Cardiovascularsystem:Structure of heart, itschamber, valves, function ofarteries, vein and capillari.Systemic and pulmonary circulation;Blood: Composition and Functions.Blood pressure.

Unit 3: Neuro Endocrine System and Reproductive System

Nervoussystem:Structure and function ofhuman brain andspinal autonomic nervoussystem [sympathetic andparasympathetic];Structure andfunction: eye, ear, nose, tongue and skin;Basic understanding about the functions ofvarious endocrine glands-pineal,pituitary, thyroid, parathyroid, thymus, pancreas, adrenal, ovary and testes.Reproductive System:functional anatomy of male reproductive system and female reproductive system.

Unit 4: Limphatic and Immune System

Lymphoid organ: Bone marrow,Thymus,Spleen, Lymph node, Composition and function of lymph; Immunity in brief, Types of immunity: Innate immunity and acquiredimmunity.

Text Books

1. Tortora, G.J.&Derrickson,B.N. (2009). Principles of anatomy and Physiology-(14th ed.). Hoboken, NJ: Wiley.

2. Guyton, A.C. & Hall, J.E.(2006).Text book of medical physiology (11th ed.). Pennsytvania: Elseveir.

3. RossandWilson:AnatomyandPhysiologyinHealthand111ness(11thed.).London:Elsevier.

4. Principlesofanatomyandphysiology-II(14thed.).Hoboken,NJ:Wiley.Udupa,K.N.(2007).

Reference Books

1. Balkrishna, A.(2007). Yoga in synergy with medical science.Haridwar, India: DivyaPrakashan Books.

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COURSE DETAILS

SUBJECT TITLE: Pharmacotherapeutical Science

SUBJECT CODE: - PGDYA-CT 104

SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4

Course objectives:

The teaching-learning of this paper will enable learner to-

1) the students will learn about basicelements ofpharmacokinetics their Model ofdistribution and develop the understanding about their chronicadministration.

2) Have knowledge of modelingconceptsinrelation*to*pharmacokinetics.

3. Students will also learn the concept of pharmacotherapeutic.

Course Outcomes:

1. The students will well understand the various concept of pharmacokinetics.
2. The students will develop the concept of pharmacodynamics.
3. Students will learn about the drug delivery system.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**-**	**-**
Hts/Week		**4**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**-**	**-**	

Unit1:Introducingpharmacokineticandpharmacodynamicconcept112Hr.]

Basicelements ofpharmacokinetics, Model ofdistribution,Chronicadministration:Constant-rateinfusion,Multipledosing,Additionalconsiderations:Transporters, Absorption, Displacement,Additionalcomplexities,andPharmacodynamicconsiderations.

Unit2Modellingconceptsinrelation*to*pharmacokinetics[13Hrs.}
Solutionsofsystemfor*a*giveninitialinjection,repeatedmedication,truncatedinfusion

Solutionforspecialcases:Singlecompartment,twocompartment:clinicalbromosulphaleintest,repeated penicillin application, compartment modelfordiabetes mellilus.

Unit 3 Pharmacotherapeutic concept [35 Hrs]

Respiratoinfectionsrinarytractinfection,Gastrointestinal*infectionDiabetesmellitus* LeukemiaRheumatoidarthritisGlucoma,Drugincluded*skin*disorders*Constipation*and diarrhoeaand Pain.

Text Books

1. ClinicalPharmacyandTherapeutics-RogerandWalkerChurchill*Livingstone* publicalion.
2. MathematicalmodelsinBiologyandMedicine,J.*N.*Kapur,East-West*PressPrivate* Limited.
3. EssentialsofMedicalPhannacology,K.D.*Tripathi,*JaypeeBrothers*Medical* Publishers(P)Limited.
4. Drug-DrugInteractions,A.*David*Rodrigues,InfonnaHealthcareUSA*Inc.*
Yogainsynergy*with*medicalsciences,Acharya*Balkrishna,D*

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COURSE DETAILS
SUBJECT TITLE: Diet and Nutrition
SUBJECT CODE: - PGDYA-CT 105
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4
Course objectives:
Following the completion of this course, students shall be able to

1. Understand the concept of diet and the medical value of nutrition.
2. Advise appropriate diet to different age groups.
3. Know the benefits and caloric value of various food groups.
4. Understand and practice daily regimen, night regimen and seasonal regimen for health promotion, disease prevention and age reversal.

Course Outcomes:
1. The students will well understand the various diets and their used in day to day life using ayurveda and modern science.
2. The students will develop the concept of Yogic diet and concepts ofdiet according to GherandaSamhita, Hatha Pradeepika and Bhagavadgeeta-Rajasic,Tamasicand Sattvic food.
3. Students will get training in wellness center and will directly interact with patients and develop the skill to treat them with proper dietusing yogic andayurvedic concept.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**-**	**-**
Hts/Week		**4**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**-**	**-**	

Unit1:Basicunderstanding offoodanditsimportanceintermo fnutrition[l0Hr .]

Basicconceptsandcomponentsoffoodandnutrition Understanding Nutrition Basic TerminologyinRelationtoNutritionRequirement,HumanNutritionalRequirements;Concept offood, Acceptance of Food, FunctionsofFood;Components of Food &theirClassification.

Unit 2: basic understanding of different nutrients and its importance [12 hrs]

Macro Nutrients- sources, functions and effects on the body; Micro Nutrients – sources, function and effect on the body; Fats soluble nutrients- sources, functions and effecst on the body; Water soluble nutrients – sources, Functions and effects on the body.

Unit 3: Basic idea of different groups of foods available in relation to nutrients [14 hrs]

Food groups, Cereals &Millets- Selection, PreparationandNutritiveValue;Pulses, Nuts and Oil-Seeds- Selection, Preparation and Nutritive Value; Milk and Milk Products- Selection, Preparation and Nutritive Value; Vegetables and Fruits- Selection, Preparation and Nutritive Value,Fats, Oilsand Sugar, Jaggery-Selection,Preparationand Nutritive Value.

Unit 4: Basicideologyofyogaasrecommendedforyogapractitioners**(14Hrs.]**

Yogic concept of diet &nutrition GeneralIntroduction of Ahara(Diet), concept of Mitahara; Definition and Classification in Yogic diet according to traditional Yoga texts; Concepts ofDiet according to GherandaSamhita, Hatha Pradeepika and Bhagavadgeeta-Rajasic,Tamasicand Sattvic food; Pathyaand Apathyain diet according to Yogic texts;lmportanceof Yogic Diet in YogSadhana; YogicDietand itsrole in healthy living.

UNIT5: Classificationofdietasrecommendedfromtwodifferentschoolsofthought traditional aswell asmodern **(10 Hrs.]**

Ancient&Modern classification,Quality ofdiet&itsrelation with Agni,Ayurvedic Concept ofDiet: Diet according to the body constitution (Prakriti)-Vata,Pitta andKapha, PathayaAahara-Vihar,VirudhaAaharaand HitkariSamyoga, Anupan,Types of Rasa, Characteristics of Rasa, Aama Rasa.

TextBooks

1.StanleyDavidson&others:HumanNutrition&Dietetics,TheEnglishLanguageBook Society &ChurchillLivings,RevisedEdition.
2. DennisThompson:TheAyurvedicDiet,Newagebooks,NewDelhi,200l.
RandolphStone:APurifingDiet, LilawatiBhargavCharitableTrust, Delhi,Revised Edition.
3. WorldHealthOrganisation/WorldEconomicForum.(2008).Preventing NoncommunicableDiseasesintheWorkplacethroughDietandPhysicalActivity WHO/WorldEconomicForumReportofaJoint Event.WorldHealthOrganisation/ WorldEconomicForum,52.doi:ISBN9789241596329

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COURSE DETAILS
SUBJECT TITLE: Yoga Practicum
SUBJECT CODE: - PGDYA-CT 106
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4
Course objectives:

The teaching-learning of this paper will enable learner to-

1. Understand the benefits, contraindications and procedure of all practices.
2. Demonstrate each practice with confidence and skill.
3. Explain the procedure and subtle points involved.
4. Teach the yoga practices to any given group.

Course Outcomes:

1. The students will well understand the various concept of asanas and their practical's aspects
2. The students will develop the confidence to perform various postures.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**-**	**2**	**-**
Hts/Week		**-**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**		**Internal Assessment (CT+TA/PR)**
70	**30**	**-**		**-**

Unit 1: Yogic Sthulavyayama

12stepsofYogicJoggingandaseriesof12YogicPostures:MandukAsana-Variations 1&2, Shashakasana, Bakrasana, Gomukh Asana, Makarasana:- Variations 1 & 2, Bhujanga Asana Variations1,2&3,Shalbhasana-Variations1,2&3,Markatasana-Variations 1, 2&3,Pawanmuktasana-Variations1,2&3,ArdhaHalasana,PadvrirtaAsana- Variations1& 2and Dwichakrikasana- Variations 1 &2; as recommended by Swami Ramdev.Suryanamaskara.

Unit 2: Yogasana [30 hrs]

Tadasana,Vrikshasana,Urdhva-Hastottanasana, Kati *Chakrasana,* ArdhaChakrasana, PaadaHastasana,TrikonasanaParshvaKonasanaVeerabhadrasan,Dandasana,Swastikasana, Padmasana,ajrasana,SuptaVajrasana,Kagasana, Utkalasana,Gomukhasana, UshtrasanaShashankasana,Janusirasana, Paschimottanasana,Bhramacharyasana, Mandukasana,

UtthanaMandukasana,Vakrasana,ArdhaMatsyendrasana, Marichayasana,Simhasana, Pavanamuktasana,Utlhana-padasana,ArdhaHalasana,Halasana, Setuba11dhasana, Sarvangasana,Matsyasana,ChakmsanaShavasana,Makarasana,Bhujangasana,Shalabhasana, Dhanurasana.

UNIT3:Shatkarmas [10hrs.]

Dhauti(KunjalDhauti);Neti(Jalneti,Sutraneti);Kapalbhati*and*itsvariants;Agnisara.

UNIT4:Pranayama[10Hrs.]

Bhastrika,Kapalbhati,Bahya,Ujjyai,Anulomvilom,Bhramari,Udgeethand*Pranav*as recommendedbySwamiRamdev.

TEXTBOOKS

1. SwamiDhirendraBhramhachari:YogicSukshmaVyayama,DhirendraYogaPublications, New Delhi, 1980

2. SwamiDhirendraBhramhachari:YogasanaVijnana,DhirendraYogaPublications,New Delhi,I966.

REFERENCEBOOKS

1. Swami*Kuvalyananda:*Asana, Kaivalyadhama, Lonavla,1993.

2. Swam,SatyanandaSaraswati:Asana,Pranayama,Bandha,Mudra,Bihar Schoolof Yoga, Munger,2006.

3. Basavaraddi,I.V:&others:YOGASANA:AComprehensivedescriptionaboutYogasana, **MDNIY,New**Delhi,2011.

4. Basavaraddi,*I.*V.&others:YogicSukshmaEvamSthulaVyayama,MDNIY, New Delhi, 2011.

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COURSE DETAILS
SUBJECT TITLE: Ayurveda Practicum
SUBJECT CODE: - PGDYA-CT 107
SEMESTER – I, TOTAL HOURS: 30 CREDITS: 2

Course objectives:

The teaching-learning of this paper will enable learner to-

1.The students will learn all the practical aspect of Shirodhara, Shiroabhyanga, Abhyanga, Udhvaetanam.

2. Have knowledge of Janubasti, Kati basti, Nasya, Karpooran, Nabhipooran
3. The students will also learn the concept of Shirobasti, Anuvasanabasti, Niruhabasti, Dhumrapana, Akshitarpan**.**

Course Outcomes:

1. The students will well understand the various concept of Ayurveda in day to day life using ayurvedicpractice and modern day.
2. The students will develop the concept of Ayurveda as well as modern science.
3. Students will get training in wellness center and will directly interact with patients and develop the skill to treat them with ayurvedictreatments.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**-**	**2**	**-**
Hts/Week		**-**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
		35	**15**	

Unit 1

Shirodhara, Shiroabhyanga, Abhyanga, Udhvaetanam,

Unit 2
Janubasti, Kati basti, Nasya, Karpooran, Nabhipooran,

Unit 3
Shirobasti, Anuvasanabasti, Niruhabasti, Dhumrapana, Akshitarpan.

Unit 4

Each Student has to prepare an assignment on any one of these above mention topic.

Text books

1. Ayurvediyapanchakarmavigyan by vaidyaShridharHaridasKaustura.
2. Principles and practice of panchakarma by Dr. PulakKantiKar.
3. Golden words on Tridosha by Dr. L Mahadevan
4. Principle and practice of basti karma by vaidyaVasant C patil.

SEMESTER - II

University of Patanjali, Haridwar
Structure of B.Sc. (Hons) Biological Science under CBCS
Core Course

COURSE DETAILS
SUBJECT TITLE: Yoga and nature cure
SUBJECT CODE: PGDYA-CT 201
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4

Course Objectives:
1.A PG student, at the end of this theory teaching will be able to understand the etio-pathogenesis of diseases and the concept and the Pathological effect of various non-communicable diseases and the body's capacity for healing.
2. Have an understanding of the common hematological disorders and the steps necessary to understand them.
3. Understand the pathogenesis of gastrointestinal disorders.

Course Outcomes
1. The students will well understand the various concept of Pathology.
2. The students will develop the understanding of hematology and gastrointestinal pathology.
3. Students will learn the various prospects of pathology and related disease.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**-**	**-**
Hts/Week		**4**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**-**	**-**	

Unit 1: INTRODUCTION TO YOGA THERAPY & NATUROPATHY
General introduction to Yoga therapy and Naturopathy; their definition, meaning, scope and limitations;Comparative study of the Naturopathy& Yoga therapy with other systems of Medicine. [10 hours]
Unit 2: PRINCIPLES AND CONCEPTS OF YOGA THERAPY &NATUROPATHY
Concept of Health According to WHO and Indian Systems of Medicines i.e. Ayurveda, Yoga, Naturopathy and Siddha Systems of Medicine; Utility and Limitations of these systems in health and healing. Fundamental principles of Naturopathy and Yoga Therapy [15 hours]
Unit 3: NATUROPATHY

Laws of Nature: Pancha- Mahabhootas;Introduction, definition, scope, history, principles of therapies based on 5 elements: Mud therapy, Hydrotherapy, Sun therapy, diet, massage, Upavasa (Fasting) and their role in health promotion and prevention of diseases. [10 hours]

Unit 4 YOGA THERAPY

Concepts of trigunas, pancha-mahabhutas, panchakoshas, pancha-prana, nadis, chakras, and their role in health and healing.Shuddhiprakriyas in yoga: role of shuddhiprakriyas in preventive and curative health, karma shuddhi (yama, niyama), ghatashuddhi (shatkarma), snayushuddhi (asana), pranashuddhi (pranayama), indriya and manoshuddhi (pratyahara), mana, buddhi, ahankara and chittashuddhi (dharana, dhyana and samadhi).

Therapeutic benefits of yogic shatkarma, asanas, pranayama, mudras, bandhas, pranayamas, and meditation techniques. [35 hours]

Text Books

1.Patanjali Research Foundation. (2015). Research Publications.Haridwar, India: DivyaPrakashan.
2.Ramdev, S. (2006). Yoga Sadhana and Yoga ChikitsaRahasya.Haridwar, India: DivyaPrakashan.
3.Ramdev, S. (2009). PranayamRahasya.Haridwar, India: DivyaPrakashan.
4.Balkrishna, A. (2007). Yoga in synergy with medical science.Haridwar, India: DivyaPrakashan Books.
4.Balkrishna, A. (2017). Yoga Vigyanam.Haridwar, India: DivyaPrakashan.
5. PreetiGoel& Rita Jain: Spectrum of Health (Sports Publications, New Delhi, 2003)
6. M. M. Gore: Anatomy and Physiology of Yogic Practices (New Age Books, New Delhi, 2008)
7. Saraswati, S. S. (1995). Asana, Pranayama, Mudra and Bandha.Munger, India: Bihar School of Yoga.
8. S. D. Dwivedi : Naturopathy for perfect health, Kalpaz Publication Delhi, 2002 PraveshHanda : Naturopathy and Yoga, Kalpaz Publication Delhi, 2006
9. S.J.Singh. : My Nature Cure or Practical Naturopathy
10. M.K.Gandhi : The story of my experiment with truth
11. R.K.Garde :Ayurvedic for Health and Long life Harry Benjamin. : Everybody's Guide to Nature Cure.
12. Malshe, P. C. (2012). A Medical Understanding of Yoga (2nd ed.). Haridwar, India: AntarPrakash Center for Yoga.
13. Coulter, H. D. (2006). Anatomy of Hatha Yoga. Delhi, India: MotilalBanarasidas.
Robin, Mel. (2009). A Handbook for Yogasana Teachers. Arizona: Wheatmark.

University of Patanjali, Haridwar
Structure of B.Sc. (Hons) Biological Science under CBCS
Core Course

COURSE DETAILS
SUBJECT TITLE: Complementary & Alternative Therapy
SUBJECT CODE: PGDYA-CT 202
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4

Course Objectives
The teaching-learning of this paper will enable learner to-
1. State concept, prevalence, objectives, types, applications and limitations of CAT.
2. Have knowledge & skills of therapeutics related to acupressure, pranic healing, and dietary supplements for managing some of the common health problems and rejuvenation.

Course Outcomes
1. The students will well understand the various concept of complementary & alternative Therapy.
2. The students will develop the skill of various naturopathy therapies like acupressure, hydrotherapy and other diseases related to health.
3. Students will get training in wellness center and will directly interact with patients and develop the skill to treat them with various therapies.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**-**	**-**
Hts/Week		**4**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**-**	**-**	

UNIT 1
CAT: History, Meaning, Definition, Objectives, Types, Prevalence, Contemporary Need, Applications and Limitations. Mind-Body Therapy: Origin, Meaning, Definition, Aims, Principles, Factors, Impacts, Prevalence, Applications, and Limitations. [10 hours]

UNIT 2
Manipulative-Body Based Therapy (MBT): Meaning, Definition, Aims, Principles, Types, Impacts, Prevalence, Applications, and Limitations. Acupressure: Origin, Meaning, Definition, Principles, Five Elements Theory, Chi Clock Cycle, Meridian Systems and Locating Acupoints on 12 Major Meridians and Reflexology. [10 hours]

UNIT 3

Energy Medicine: History, Meaning, Definition, Types, Principles, Applications and Limitations. Pranic Healing: Origin, History, Meaning and Sources of Prana; Principles, Law of Action, & Types (Basic, Advanced, and Psychotherapy); Bio-plasmic body/Aura: structure, types and size; Energy Centers (EC): Meaning, Types (Major, Minor and Mini), Sizes, Colors, Functions and Consequences of their Dysfunctions; Ahartic Yoga & Twin Meditation, Scanning Auras or Chakras, Sweeping and Energizing Procedures. [14 hours]

UNIT 4

Acupressure &Pranic Therapeutics: Low Back Pain, Arthritis, Obesity, Diabetes, Hypertension/Hypotension, Hyper/Hypo Thyroidisim, Liver Problem, Allergy, CAD, Anemia, Hyperacidity, Irritable Bowel Syndrome, Colitis, Piles, Migraine, Insomnia, Depression, Chronic Fatigue Syndrome, Epilepsy, Anxiety, Obsessive Compulsive Disorder, Leucorrhoea, Menstrual Disorders, Impotency, Infertility, CSF, Asthma, Pneumonia, Renal Problem, Varicose Veins, Distress, and Myopias. [14 hours]

UNIT 5

Biologically Based Products (Dietary Supplements & Herbal Remedies) Probiotics and Prebiotics, Antioxidants, Glucosoamine Sulfate, Gultamine, Selenium, Curcumin, Multi-vitamins and their Natural Sources, Omega-3 Fatty Acid and Tryptophan; their Functions and natural Sources; Rejuvenating & De-stressing Herbs: Basil, Allovera, Awala, Giloya, Tea, Mint, Peppermint, Ashwagandha, Satabari, KaunchBeej, Brahmi, Sankhapuspi, Jatamasi, MithiBuch and; their usages. [12 hours]

Text Books

1.Acharya, B. (2004). AusadhDarshan.Haridwar, India: DivyaPrakashan.

2. Acharya, B. (2005). Ayurveda Jadi-butiRahasya. Haridwar, India: DivyaPrakashan.

3. Brahmabarchas. (2003). NidanChikitsa.Haridwar, India: Ved Mata Gayatri Trust.

4. N. R., Walker, B. R. & Ralston, S. H. (2010). Davidson's Principles & Practice of Medicine (21st ed.). China: CHURCHILL LIVINGSTONE, ELSEVIER.

5. Holford, P. &Burne, J. (2007). Food is better medicine than drugs. Great Britain: Piatkus.

6. Holford, P. (2014). Good Medicine. Great Britain: Piatkus.

7. Joshi, S. A. (2011). Nutrition and dietetics with Indian case studies. New Delhi, India: Tata McGraw-Hill.

8. Lian, Yu-Lin; Chen, Chun-Yan; Hammes, M. &Kolster, B. C. (2005). Pictorial atlas of acupuncture: An illustrated manual of acupuncture points.

9. Solvenia: h. f. ullmann. Micozzi, M. S. (2015). Fundamentals of complementary and alterntive medicine (5th ed.). China. ELSEVIER SAUNDERS.

10. Patanjali Research Foundation.(2015). Research Publications.Haridwar, India: DivyaPrakashan.

11. Peeters, J. (2008). Reflexology. Bath BAIIHE, UK: Paragon.

12. Ramdev, S. (2006). Yoga Sadhana and Yoga ChikitsaRahasya.Haridwar, India: DivyaPrakashan.

13. Ramdev, S. (2009). PranayamRahasya.Haridwar, India: DivyaPrakashan.

14. Sah, R. L., Joshi, B., & Joshi, G. (2002). Vedic health care system. New Delhi, India: New Age Books.

15. Sharma, S. (1998). JivemSaradmSatam. Mathura, India: AkhandJyotiSamsthan.

16. Sharma, S. (2010). GayatriMahavijyan (Combined and revised ed.). Mathura, India: YugNirmanYojanaBistar Trust.
17. Sui, M. C. K. (2002). Miracle through pranic healing (3rd ed.). New Delhi, India: All India Pranic Healing Foundation.
18. Sui, M. C. K. (2005). Advanced pranic healing.Banglore, India: World India Pranic Healing Foundation-India.
19.Sui, M. C. K. (2005). Pranic Psychotherapy (2nd ed.). Banglore, India: World India Pranic Healing Foundation-India.
20. Yogananda, P. (2011). Journey to self-realization. Kolkata, India: YogodaSatsang Society of India.
21. Mohan, H. (2010). Textbook of pathology (6th ed.). New Delhi, India: JAYPEE BROTHERS MEDICAL PUBLISHERS (P) LTD.
22. Sharma, S. (2013). ChikitsaUpcharKeVividhAyam (2nd ed.). Mathura, India: AkhandJyotiSamsthan.
23. Sharma, S. (2013). NirogJeevanKeMahatopurna Sutra (2nd ed.). Mathura, India: AkhandJyotiSamsthan.
24. Sharma, S. (2013). PranChikitsa (2nd ed.). Mathura, India: AkhandJyotiSamsthan.
25. Sharma, S. (2006). Diagnose, cure and empower yourself by the currents of breath. Haridwar, India: ShriVedmataGayatri Trust.
26. Yuan, Chun-Su., &Bieber, E. J. (2003). Textbook of complementary and alternative medicine. New York, NY: The Parthenon Publishing Group.

University of Patanjali, Haridwar
Structure of PostGraduate Diploma in Yoga and Ayurveda
Core Course

COURSE DETAILS
SUBJECT TITLE: Important Indian Medicinal Herbs
SUBJECT CODE: - PGDYA-CT 203
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4

Course Objectives:

1. This paper will provide knowledge and skills about various herbs
2. They will learn to identification the plants and their medicinal properties.
3. Students will also learn the physical, chemical properties of Indianherbs.
4. Students will learn the role of medicinal plants in ayurveda.

Course Outcomes

1. The students will well understand the various concept of herbal medicine.
2. The students will understand the concept of Ayurveda and role herbs in traditional medicine system.
3. Students will get training in PHRD center and will directly interact with researcher's and develop the skill for the use of herbs.

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Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**-**	**-**
Hts/Week		**4**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**-**	**-**	

Unit-1

The Physical, chemical and medicinal properties of the following herbal plants
Amla
Ashwagandha
Brahmi
Giloye

Unit-2

The Physical, chemical and medicinal properties of the following herbal plants
GoharuChota
GwarpathaGhritkumari (Aloevera)
Isabgol
Harad (Haritaki)

Unit -3

The Physical, chemical and medicinal properties of the following herbal plants
Neem-nimb

Nirgundi
Shankhapushpi

Unit-4

The Physical, chemical and medicinal properties of the following herbal plants
Shatavar
Triphla
Tulsi

Text Book:

1. Secrets of Indian Herbs for Good Health, AcharyaBalkrishna, DivyaPrakashan.
2. VanaspatiAushadhVighyan (A Complete Book of Indian Medicinal Herbs) (Hindi), Ramesh Kumar Bhutya (2007).

University of Patanjali, Haridwar
Structure of Post graduate diploma of yoga and Ayurveda

COURSE DETAILS
SUBJECT TITLE: Basics of Healthy Living
SUBJECT CODE: - PGDYA-CT 204
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4

Course Objectives:
The teaching-learning of this paper will enable learner to-
1. State concept, prevalence, objectives, types, applications and limitations of various hygine concepts.
2. Have knowledge of infection and related diseases such as Malaria, Dengue, Dysentery, cholera, typhoid and Chicken pox, measles, mumps etc and also develop the concept of Immunity too.
3. Students will also learn the concept of ayurveda such as Swasthavritta, Dincharya (Daily regimen) &Ratricharya, Ritucharya and Aggravation and Pacification of three Humors (vata, pitta, kapha).

Course Outcomes
1. The students will well understand the various concept of hygiene in day to day life using ayurveda and modern science.
2. The students will develop the concept of Ayurveda as well as modern science.
3. Students will get training in wellness center and will directly interact with patients and develop the skill to treat them with proper hygiene and ayurvedic concept.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**-**	**-**
Hts/Week		**4**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**-**	**-**	

Unit : 1 INTRODUCTION TO HEALTH AND HYGIENE
Personal hygiene, Definition of health and factors; affecting it- food habits, cleanliness, exercise and sleep; Water – Importance of water, impurities present in water, sources of contamination of water and water purification (Household and natural methods); First aid: meaning, importance in daily life.

Unit: 2 INFECTION AND DISINFECTANTS
Infection – Definitions of Infection, Infective agents, Period of infectivity; Types of diseases and their modes of spread; Channels of infection; disinfectants – Definition, types and methods of disinfection.

Unit: 3INFECTIOUS DISEASES
Infectious diseases - Causes, incubation period, mode of spread, symptoms, prevention & control

of the following diseases); Diseases spread by insects -Malaria, Dengue; Diseases spread by ingestion - Dysentery, cholera, typhoid; Diseases spread by droplet infection - Chicken pox, measles, mumps; Disease spread by Contact - Leprosy, AIDS. Immunity - Definition, types of immunity & immunization schedule Common emerging health problems among women: Cancer of Breast and Cervical.

Unit:4 Health and hygiene in Ayurveda

Swasthavritta: Meaning, Definition, Aims and Aspects; Wellness: Meaning, Definition, Indicators and dimensions; Dincharya (Daily regimen) &Ratricharya (Night Regimen): Meaning, Definition and sequential elements with their practical applications; Ritucharya (Seasonal Regimen): Meaning, Definition, Types with their sailent features, Seasonwise Accumulation, Aggravation and Pacification of three Humors (vata, pitta, kapha); Seasonwise Do's and Don'ts; Application of Dincharya, Ratricharya and Ritucharya for health promotion, rejuvenation, disease prevention and age reversal. A General Introduction of treatments methods used in Ayurveda

TEXT BOOKS

1.Yash pal Bedi (1976) Hygiene & Public Health. Anand Publishing Co., gali No. 1, NawanKot Amritsar.

2. V. N. Hhave, (1975) You & Your Health.. National Book Trust

3.BihariLal Bhatia, (1961) Elementary. Hygiene, Orient Longmans, Ltd. Calcutta -13

4. J.E. Park, (1983) Prenentive& Social Medicine, Jabalpur MessrsBanarcidasBhanot

5. BirendraNathGhosh, (1969) Hygiene & Public Health Calcutta Scientific Publishing Co.

6. Secrets of health and longevity. Dr. OmkarNath

COURSE DETAILS
SUBJECT TITLE: Disease specific Pathology
SUBJECT CODE: PGDYA-CT 205
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4

Objectives:

1. A PG student, at the end of this theory teaching will be able to understand the etio-pathogenesis of diseases and the concept and the Pathological effect of various non-communicable diseases and the body's capacity for healing.
2. Have an understanding of the common haematological disorders and the steps necessary to understand them.
3. Understand the pathogenesis of gastrointestinal disorders.

Course Outcomes
1. The students will well understand the various concept of Pathology.
2. The students will develop the understanding of hematology and gastrointestinal pathology.
3. Students will learn the various prospects of pathology and related disease.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**4**	**-**	**-**
Hts/Week		**4**	**-**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:50**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**-**	**-**	

Unit-1: Introduction to pathology [10Hours]

Importance of the study of pathology; Definition of terms; Methods and techniques; Cellular and Tissue changes; Infiltration and regeneration; Inflammations arid Infections; Wound healing; Vascular changes; Cellular growth, Neoplasms; Normal and Cancer cell; Benign and Malignant growths; Carcinoma Disturbances of fluid and electrolyte imbalance.

Unit-2: Hemodynamics changes [15 Hours]

Oedema, Shock, Thrombosis, Embolism, Infarction; Neoplasia: Cell cycle, Hyperplasla, Metaplasia, Hypertrophy, Atrophy, Nomenclature (classification of tumours), Differences between begin and malignant tumours, Aetiopathogenesis of

neoplasia (cancer), Signs of malignancy, Chemical and physical carcinogens, Biological carcinogens (RNA & DNA viruses), Spread of tumours (Metastasis), Dysplasia (Carcinoma in-situ), Lab diagnosis of cancer.

Unit-3: Haematology [20Hours]

Normal Haematopoiesis, Bone marrow examination, Anaemia (Classification of anaemia); 2.Iron deficiency anaemia, Vitamin 1312 deficiency anaemia (megaloblastIcanaemia), Pernicious anaemia, Haemolyticanaemia (inherited disorders & acquired), Hereditary Spherocylosis, Hereditary Elliptocytosis, Immune Haemolyticanaemia, Thalassemia, Sickle cell anaemia, Apiasticanaemia, Polycythaumia; Agranulocytosis, Leucocytosis — Leukcpenla, Leukemoid, Reaction; Leukaemia Lymphomas (Hodgkin's & non-type Hodgkin's; Normal Coagulation mechanism; ThromboCytopenia (I1P); Haemophilia; Christmas Disease—Haemophilia B; Von-willebrnads disease; DIC (Disseminated Intravascular Regulation), Rh Incompatibility

Unit-4:Gastrointestinal pathology [15 Hours]

Typhoid, Tuberculosis, Crohn's disease, Appendicitis; Inflammatory diseases of appendix and large Amoebi: colitis, Bacillary dysentery; Ulcerative Colitis; Ischemic and:s'.2udomeenbranous enterocolitis, diverticulosis; Malabsorption: Celiac disease, Tropical and other causes; Jaundice Types, Pathogenesis arid Differentiation; Hepatitis: Acute and Chronic Etiology, Pathogenesis and pathology; Cirrhosis: Ateiology, Post necrotic, Alcoholic, Metabolic, Pathology, Morphology ((Macronodular, Micronodular, Mixed), complications; Portal Hypertension: Types including non-cirrhotic portal fibrosis and manifestations.

Text Books

1. Pathologic basics of disease- Kumar, cortan-Saunders Collins
2. Basic Pathology- Kumar, cortan-Saunders
3.Text book of Pathology-Andersons-C.V. Mosby Volume I & II Company
4.General Pathology- Walter & Israel
5.Clinical Laboratory Methods-RAmniksood-Jaypee
6.G.C.DeGruchy Clinical-David Penington-CBS Publishers &Haematology in medical
7.Bryan Rush Distributors Peter Castaldi
8.IIlustrated Pathology-Govans-ELBS Edition 1992

University of Patanjali, Haridwar
Structure of Post graduate diploma of yoga and Ayurveda
COURSE DETAILS

SUBJECT TITLE: Yoga Practicum-II
SUBJECT CODE: - PGDYA-CT 206
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4

Course objectives:

Following the completion of the course, students shall be able to:

1. State techniques, health benefits, applications, precautions and contraindications ofunder mentioned yogic practices.

2. To demonstrate and instruct under mentioned yogic practices.

Course Outcomes:
1. The students will well understand the various concept of yoga in day to day life using various aasans.
2. The students will develop the concept of yoga and their postures.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**-**	**2**	**-**
Hts/Week		**-**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**	**Internal Assessment (CT+TA/PR)**	
70	**30**	**-**	**-**	

UNIT1:Shatkarmas(lOHrs.)

Dhauti(Kunjal),Vastradhauti,Dandadhauti,

LaghooandPoornasankhaprakshalana,Neti(Sutra and Jala), Kapalbhati, Agnisara,

Nauli

UNIT2:Warmupyogicexercises[10Hrs.]

YogicJogging,12Healthpromotingposturesasrecommendedby SwamiRamdev,

Suryanamaskarpracticeclassicallyandinvaried formsforpreventionandtherapy.

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Unit 3: Asanas Yogic Postures [30 hrs.]

Standing Postures:ArdhakatichakrasnnaHastapadasana, Ardhachakrasana, Trikonasana, katichakrasnaParivrittalrikonasana, Parsvakanasana, Veersana,

Sitting

Postures:Paschimottanasana,suptavajrasana,ardhamatsyendrasana,vakrasana, marichasana,malasana, mandukasana, vakrasana, badhakanasana, merudandasana, akamadhanurasana, gumukhasana,Chakkiasana.

PronePosture: Bhujangasana,sarpasana, naukaasana,Salabhasana,Ohanurasana, Urdhvamukhosvanasana, Makarasana,

SupinePostures: Halasana,Chakrasana, Sarvangasana, Matsyasana,Shavasana, Setubandhasana,pad vritta asana, cycling.

Balancing Postures: Vrikshasana, vakasana, Garudasana, Namaskarasana,Tittibhasana, Natrajasana

UNIT4:Pranayama(10Hrs.]

Breathawareness,Diaphragmatic breathing,Abdominalbreathing,Bhastrika,Kapalbhati, Anulom-vilom,Nadisodhan,Bahya, Ujjyai,Bhramari, Udgeeth,Ujjai,Sitali,Sitkari, Suryabhedi.

TEXTBOOKS:

1. Balkrishna,A.(2007).Yogainsynergywith medicalscience.Haridwar,India: DivyaPrakashan Books
2. Balkrishna,A.(20J7).YogaVigyanam.Haridwar,India:OivyaPrakashan.
3. PatanjaliResearchFoundation.(2015).ResearchPublications.Haridwar,India:Divya
4. PrakashanRamdev,S.(2006).YogaSadhanaandYogaChikitsaRahasya.Haridwar,India: DivyaPrakashan.
5. Ramdev,S.(2009).PranayamRahasya.Haridwar,India:DivyaPrakashan.
6. YogaforPromotionofPositiveHealth,byDrRNagarathna, DrHRNagendra Published by SVYP, 2002

University of Patanjali, Haridwar
Structure of Post graduate diploma of yoga and Ayurveda

COURSE DETAILS
SUBJECT TITLE: Pathology Practicum
SUBJECT CODE: - PGDYA-CT 207
SEMESTER – I, TOTAL HOURS: 60 CREDITS: 4

Course objectives:

The teaching-learning of this paper will enable learner to-

1) Students will understand the concept of Blood groups (ABO system); Estimation of hemoglobin; Enumeration of RBCs (RBC count); Total leucocyte count (Total count);.

2) Have knowledge of Differential leucocyte count (DC); Peripheral smear staining and reporting; Absolute eosinophil count.

3. Students will also learn the concept of Anemia: Hemogramsin anemia, Iron deficiency anemia, Macrocytic anemia, Microcytic anemia, Hemolytic anemia

Course Outcomes:

1. The students will well understand the various practical concept of Pathology.
2. Students will get training in the Ayurveda college pathology lab and will directly get the lab practices.

Total Number of Hrs. : 60		**Theory**	**Practical**	**Tutorial**
Credits		**-**	**2**	**-**
Hts/Week		**-**	**2**	**-**
SCHEME OF EXAMINATION				
Total marks: 100				
Theory:100		**Practical:NA**		
Final Exam (SEE)	**Internal Assessment (CT+TA)**	**Final Exam (SEE)**		**Internal Assessment (CT+TA/PR)**
70	**30**	**-**		**-**

UNIT 1: Hematology –I [15 Hrs] Blood groups (ABO system); Estimation of hemoglobin; Enumeration of RBCs (RBC count); Total leucocyte count (Total count);

UNIT 2: Hematology-II [15 Hrs.] Differential leucocyte count (DC); Peripheral smear staining and reporting; Absolute eosinophil count

UNIT 3: Anemia-I [15 Hrs.] Anemia: Hemogramsin anemia, Iron deficiency anemia, Macrocytic anemia, Microcytic anemia, Hemolytic anemia

UNIT 4: Demonstration [15 Hrs.] All candidates are expected to demonstrate the Unit-I experiments and explain the same in the practical records.

Text Books:

Practical Manual by Harsh Mohan Medical Laboratory Technology– RamnikSood