**ALAGAPPA UNIVERSITY, KARAIKUDI**

**NEW SYLLABUS UNDER CBCS PATTERN (w.e.f.2017-18)**

**M.Phil., BIOCHEMISTRY PROGRAMME STRUCTURE**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Semester** | **Course Code** | **Name of the Course** | **Cr.** | **Max. Marks** |  |
|  | **Int.** | **Ext.** | **Total** |
| I | **7PBC1C1** | **Core-I-**Research Methodology | 6 | 25 | 75 | 100 |
| **7PBC1C2** | **Core-II-**Advanced Biochemistry | 6 | 25 | 75 | 100 |
| **7PBC1C3** | **Core-III-**Teaching and Learning Skills  | 6 | 75 | 25**Viva-voce** | 100 |
| **Total** | **18** | **--** | **--** | **300** |
| II | **7PBC2C1/****7PBC2C2/****7PBC2C3** | **Core-IV-** **Guide Paper-I-** Immunology and Toxicology **(OR)****Guide Paper-II-** Nutritional and Clinical Biochemistry **(OR)****Guide Paper-III**- Medicinal Herbs and Phytotherapeutics**(OR)** | 6 | 25 | 75 | 100 |
| **7PBC2DV** | **Core-V** Dissertation&Viva-Voce | 12 | 150-D**issertation**50-**Viva-Voce** | 200 |
|  | **Total** | **18** | **--** | **--** | **300** |
| **Grant Total** | **36** | **--** | **--** | **600** |

**M.Phil. BIOCHEMISTRY**

**I YEAR – I SEMESTER**

**COURSE CODE: 7PBC1C1**

**CORE COURSE – I - RESEARCH METHODOLOGY**

**Unit- I OVERVIEW OF RESEARCH**

**Research:-** Definition, Importance and Meaning of research, Characteristics of research, Types of Research, Steps in research- Identification, Selection and formulation of research problem, Research questions, Research design, Formulation of Hypothesis, Review of Literature. **Sampling techniques**: - Sampling theory, types of sampling, Steps in sampling- Sampling and Non-sampling error -Sample size- Advantages and limitations of sampling. **Collection of Data**: - Primary Data- Meaning- Data Collection methods -Secondary data - Meaning -Relevance, limitations and cautions. **Research Report**: Types of reports - contents - styles of reporting - Steps in drafting reports- Editing the final draft evaluating the final draft.

**Unit-II DATA PRESENTATION AND STATISTICAL APPLICATIONS**

Principles of experimental design collections, assembly, analysis and interpretation of experimental data. **Data presentation:** Tabular, graphical and diagrammatic representation of data. Use of simple semi log & double graph paper in data representation. **Statistical applications in research averages:** standard deviation, standard error, analysis of variance, regression, coefficient of variation. Levels of significance, Chi square test, students test (t), ANOVA and uncan’s new multiple range test.

**Unit-III BIOINFORMATICS**

**Biological Databases and Data Retrieval**: Nucleotide (Genbank- EMBL- DDBJ)-Sequence submission Methods and tools (Sequin, Sakura, Bankit)- Sequence retrieval systems (Entrez & SRS)- Sequence File Formats and Conversion tools- Protein (Swiss-prot, PIR, Expasy)- Structural Databanks (PDB and NDB)- Protein Structure Classification (SCOP, CATH and FSSP)- Metabolic Pathway db (KEGG)- Specialized db (IMGT, Rebase, COG**). Molecular Sequence Alignment**: Pair wise Alignment- Global Alignment- Local Alignment- Visual Alignment- Dynamic Programming- Heuristic approach- Scoring Matrices and Affine Gap costs- Database Search methods- 3.Multiple Sequence Alignment methods. **Gene Prediction and Phylogenetic Analysis**: Gene structure in Prokaryotes and Eukaryotes- Gene Prediction methods- Construction of Phylogenetic trees - Distance Methods- Maximum Parsimony Method- Maximum likelihood method.

**Unit-IV SEPARATION TECHNIQUES**

**Chromatography:** adsorption, partition, paper, thin layer, paper, FLPC, cellulose derivatives affinity. **Electrophoresis:** Moving boundary, zone, starch gel, paper, cellulose derivatives Isotachophoresis, Isoelectrofocusing, High voltage electrophoresis. PAGE: Preparation of native & denaturing polyacrylamide gels and separation of proteins. Preparation of PAGE gels for DNA sequencing. Preparation of DNA fragments. Maxam and Gilbert and Sangers DNA sequencing methods. Generation of DNA sequence.

**Unit-V**  **SPECTROSCOPY & MICROSCOPY**

Principle and techniques of UV-VIS Spectrophotometry. Beer- Lambert’s law – quantitative methods of analysis coupled – assays – Kinetics – Protein estimation methods. Spectrofluorimetry – Flame – Atomic absorption Spectrophotometry. Principles – Techniques and Applications of Electron Spin Resonance – Nuclear Magnetic resonance - Circular Dichroism (CD) – Optical Rotatory Dispersion (ORD). Microscopy basic principle and applications – Light – Compound – Scanning Electron Microscopy (SEM) - Transmission Electron Microscopy (TEM) – Scanning Tunneling Microscopy (STM) – Fluorescence Microscopy – Confocal Microscopy.

**Books for Reference:**

1. Anderson, Durston, Polle (1970) Thesis and assignment writing Wil Eastern Limited

2. Research Methodology Methods and Statistical Techniques - Santosh Gupta

3. Biostatistical analysis . J.H.Zar, 4th edition.Pearson Education,Inc.India.

4. Braun, R.P. Introduction to instrumental analysis, McGrawHill.

5. Wilson & Walker, Principles and Techniques of Biochemistry and Molecular Biology.

 6th Edn, Cambridge Univ. Press. 4 4. Molecular cloning: Laboratory Manual – Maniatis,

 E.F. Fritsch and J. Sambrook

6. Genes V (1994)Benjamin Lewin ,7. Molecular Biology of the Gene 4 th byWatson, Hopkins,

 Roberts, Steitz and Weiner ,8. BiochemistryDonald Voet and Judith Voet

7. Claverie. J. M, Notredame. C. Bioinformatics For, Wiley Publishing, Inc. 2003

8. Dan.E.Krane, Michael L. Raymer 1st ed. Fundamental concepts in Bioinformatics. Pearson

 Education. 2006.

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**I YEAR – I SEMESTER**

**COURSE CODE: 7PBC1C2**

**CORE COURSE - II - ADVANCED BIOCHEMISTRY**

**Unit – I MOLECULAR BIOLOGY TECHNIQUES**

DNA Sequencing – enzymatic and chemical methods. Blotting techniques – Southern & Northern, Western &Eastern blot analysis. DNA finger printing, DNA foot printing. DNAase sequence, Branched DNA assay, DNA markers – RFLP and RAPD, SSLP, AFLP&VNTR.
PCR – principle and applications – Types of PCR, In situ hybridization and FISH. DNA chip technology - DNA microarrays, oligonucleotide microarray, BAC& SNP microarray and Protein microarray – tissue microarray.

**Unit-II IMMUNOTECHNIQUES**

Production and Applications of antisera, Polyclonal and monoclonal antibodies. Antigen – antibody interaction, precipitation reaction, immunodiffusion, immunoelectrophoresis, immunofluorescence. RIA and ELISA–hormonal assay. HLA typing. Lymphocyte isolation and complement fixation, Immunohistochemistry, immunoelectron microscopy&Immunoassay-EMIT, FPIA.

**Unit-III CELL AND TISSUE CULTURE**

**Animal cell culture** – Laboratory facilities, culture media and procedures, primary culture and cell lines, pluripotent stem cell lines, organ and embryo culture,2D,3D culture, cell cloning, micromanipulation, types of cloning and cell transformation.

**Unit-IV**

**Plant cell culture** - Preparation of media, micro propagation and somoclonal variation, production and uses of haploids, protoplast culture, regeneration and somatic hybridization. Gene transfer methods in plants-Production of secondary metabolites, Protoplast isolation and fusion, germplasm storage and cryopreservation.

**Unit-V GENOMICS AND PROTEOMICS**

Human Genome project - history, techniques and applications; Anatomy of Prokaryotic and Human Genome; Genetic mapping and genetic markers- RFLP, Mini- and Micro satellite, STS and EST, SSCP,RAPD, AFLP, SNPs. Analyzing Gene expression - DNA micro array. **Proteomics:** Introduction, electrophoresis in proteomics, 2D SDSPAGE, basic principle, Instrumentation, analysis of cell proteins, free flow electrophoresis, blue native gel electrophoresis, Mass spectrometry in proteomics, tagging methods for MS proteomics, isotope coded affinity tagging, tagging for tandem MS. Microarrays, protein biochips. Post translational modifications in proteomics, proteolysis, glycosylation, oxidation, protein disulfides, phosphoproteins.

**Books for Reference:**

1. Discovering Genomics, Proteomics and Bioinformatics, Campbell A M & Heyer L J,

 2nd Edn. Benjamin Cummings, (2007).

2. Principle and Practice of Bioanalysis; Richard F. Venn (Ed.) Taylor and Francis (2000).

 3. Concepts in Biotechnology,1996.Ed: D.Balasubramaniam. Costed IBN,University Press,India.

4. Principles and Techniques in Practical Biochemistry. Wilson and Walker, 4th edition.

 Cambridge University Press.

5. Biotechnology and Genomics, P.K.Gupta, Rastogi publications 2004, India.

6. Biophysical Chemistry, Principles and Techniques, Upadhayah and Nath, 2000, Protein.

7. Bioinformatics; M. Michael Gromiha, Academic Press 1983.

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**I YEAR – I SEMESTER**

**COURSE CODE: 7PBC1C3**

**CORE COURSE - III - TEACHING AND LEARNING SKILLS**

**Unit-I COMPUTER APPLICATION SKILLS**

Computer system: Characteristics, Parts and their functions – Different generations of
Computer – Operation of Computer: switching on / off / restart, Mouse control, Use of key board and some functions of key – Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations

**Unit-II COMMUNICATION SKILLS**

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and written; Non-verbal communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and writing – Methods of developing fluency in oral and written communication – style, Diction and Vocabulary – Classroom communication and dynamics

**Unit-III COMMUNICATION TECHNOLOGY**

Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-content – Satellite-based communication: EDUSAT and ETV channels, Communication through web: Audio and Video applications on the Internet, interpersonal communication through the web.

**Unit-IV PEDAGOGY**

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation – Versatility of lecture technique – Demonstration, Characteristics, Principles, Planning Implementation and Evaluation – Teaching – Learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Models of teaching: CAI, CMI and WBI

**Unit-V TEACHING SKILLS**

Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills

**Books for Reference:**

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New

 Delhi

2. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh

3. Information and Communication Technology in Education: A Curriculum for Schools and

 programme of Teacher development,Jonathan Anderson and Tom Van Weart, UNESCO, 2002

4. Kumar K.I (2008) Educational Technology, New Age International Publishers, New Delhi

5. Mangal, S.K. (2002) Essential of Teaching – Learning and Information Technology, Tandon

 Publications, Ludhiana

6.Michael D. and William (2000), Integrating Technology into Teaching and Learning:Concepts

 and Applications, Prentice Hall, New York

7. Pandey S.K. (2005) Teaching Communication, Commonwealth Publishers, New Delhi

8. Ram Babu A. and Dandapani S (2006) Microteaching (Vol.1&2) Neelakamal Publications,

 Hyderabad

9. Singh V.K. and Sudarshan K.N. (1996) Computer Education, Discovery Publishing Company,

 New York

10.Sharma R. A. (2006) Fundamentals of Educational Technology, Surya Publications, Meerut

11.Vanaja.M. and Rajasekar S. (2006) Computer Education, Neelkamal Publications,Hyderabad.

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**I YEAR – II SEMESTER**

**CORE CODE: 7PBC2C1**

**CORE COURSE – IV - GUIDE PAPER-I - IMMUNOLOGY AND TOXICOLOGY**

**Unit-I INFECTION**

Types of infection and nature of infective agents. Nonspecific host defense mechanisms. Anatomical barriers; lysozyme and other antimicrobial agents. Phagocytosis and phagocytic cells, neutrophils, monocytes and macrophages.

**Unit-II COMPLIMENT SYSTEM:**

Introduction, alternate and classical pathway, regulation

**Immunity:** States of immunity; innate and acquired immunity, naturally and artificial acquired passive and active immunity. Immunization practices, use of toxoids, killed and attenuated organisms. Surface components and newer vaccines, production of vaccines.

**Immunoglobulins:** Structure and functions of immnoglobulins Types; isotypes and idiotypes, Isoantibodies. Methods of raising antibodies. Monoclonal antibodies, production and purification.

**Unit-III IMMUNE SYSTEM**

Recognition of self and non self, the major histocompatibility antigens, H-2 and HLA antigens, Antigenecity; humoral and cell mediated immunity. T and B lymphocytes; origin, differentiation, characteristics and functions, nature of surface receptors, antigen processing and presentation. T cell and B cell interaction. Cytokines, monokines, lymphokiness and their functions.

**Unit-IV MOLECULAR IMMUNOLOGY**

Theories of antibody formation; clonal selection and network, Genetics of antibody diversity, germ line and somatic mutation theories, immunoglobulin, MHC, TCR gene organization and their recombination, class switch of Ig genes.

**Clinical Immunology:** Immune disorders; hypersensitivity, autoimmune and immunodeficiency diseases. Tissue transplantation; auto – iso -, allo-, and xenografts, tissue matching, transplantations rejection, mechanism and control, tumor immunology.

**Unit-V TOXICOLOGY**

Toxicological chemistry, factors influencing toxicity; Dose response relationship – LD50, ED50, NOEL. Reversibility and sensitivity. Xenobiotics and endogeneous substances. Detoxification enzymes. Mutations – genotoxicity, Ames test. Carcinogenic toxins. Cytotoxicity, methods to test toxicogens. Diagnosis of toxic effects in liver and kidney. Metal toxicity Arsenic and lead. Non metal–oxygen and ozone.

**Books for Reference:**

1. Antibodies– A Laboratory Manual; E. D. Harlow, David Lane, 2nd Edn. CSHL Press (2014).

2. Basic and Clinical Immunology; Stites et al., [Ed] (1982) Lange.

3. Roitt’s Essential Immunology; Ivan, M. Roitt & Petrer J Delves (2001) Blackwell Science.

4. Immunology: Roitt et al., Mosby (2001),

5. Kuby Immunology; Oven, Punt, Stranford, 7th Edn. W. H. Freeman (2013).

6. Immune System; M. C. Connel et al., Eds. (1981) Blackwell Science.

7. Immunology at a Glance: J.H.L. Playfare [ed.] Blackwell Science, (1987).

8. Immunology; Jan Klein [Ed.], Blackwell Science (1990).

9. Introduction to Immunology; Kim Bell [Ed.,] 3rd Edn. McMillan (1990).

10. NMS for Immunology; Hyde and Patnide [Eds.] John Wiley (1990).

11. Microbiology; Prescott, Harley and Klein, McGraw-Hill (2003).

12. Molecular Toxicology; Nick Plant, Garland Science (2003).

13. Understanding Immunology (Cell and Molecular Biology in Action); Peterwood, Pearson

 Education Ltd. (2006).

14. Introduction to Exotoxicology, En. D.W. Connell, Blackwell Scientific (2000)

15. Molecular Cell Biology Baltimore et al., Scientifica Americal Publication (1995).

16. Molecular Pharmacology, ed. T. Kenakin, Blackwell Science Inc (1997).

17. Toxicological Chemistryand biochemistry; Manahan, Stanley E. CRC Press LLC (2003).

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**I YEAR – II SEMESTER**

**CORE CODE: 7PBC2C2**

**CORE COURSE–IV - GUIDE PAPER-II - NUTRITIONAL AND CLINICAL BIOCHEMISTRY**

**Unit-I ENERGY VALUE OF FOODS**

Determination of Energy value using Bomb calorimeter- Respiratory Quotient (RQ), Basal metabolism, Determination of Basal Metabolic Rate (BMR), Factors affecting BMR, Determination of energy metabolism during work, Energy expenditure for various types of activities, Recommended Daily Allowance (RDA), Specific Dynamic Action (SDA) of foods.

**Unit-II NUTRITIONAL ASPECTS OF NUTRIENTS**

Nutritional aspects of Carbohydrates, lipids, proteins and fiber. Nutritional value of vitamins, minerals – physiological and biochemical functions, Daily requirement. Important dietary sources of proteins, Determination of nutritive value of proteins, Biological value of proteins (BV), Protein efficiency ratio (PER), Digestability coefficient, Net protein Utilization, Net Protein Ratio(NPR), Chemical Score, Essential amino acids, Limiting aminoacids, Essential fattyacids- visible and invisible fat.

 **Unit-III FREE RADICALS AND ANTIOXIDANTS**

Sources of free radicals, chain reactions, Nutrients as antioxidant, pro-oxidant, Interactions of radicals with DNA, Lipids and Proteins, Cause of Radical damage, Various mechanisms of protection against radical damage

**Unit-IV DIET RELATED DISEASES**

Protein energy malnutrition- Kwashiorkor, Marasmus- aetiology, metabolic disorders and management. Deficiency disorders of vitamins and minerals, hypervitaminosis.

Nutritional aspects of life style diseases: Diabetes, Atherosclerosis, Cancer, Inflammatory arthritis, Obesity- Risk factors, biochemical and clinical features, Symptoms, Diagnosis, Treatment.

**Unit-V DISEASES RELATED TO DIGESTION AND ABSORPTION OF FOODS**

Gastritis, ulcers – peptic ulcer, Zollinger Ellison syndrome, Achlorhydria, Pancreatitis, Lactose intolerance, Disaccharidase deficiency, Disacchariduria, monosaccharide malabsorption, Steatorrhea, Chyluria, Cholelithiasis, and Sprue.

**Books for Reference:**

1. Food science, Chemistry and Experimental Foods - Dr. M. Swaminathan.
2. Principles of Biochemistry – Lehninger.
3. Text Book of Human Nutrition - Bamji, N. Prahlad&VinodiniReddy.
4. Natural and Therapeutic Nutrion - Tom Sanders & Peter Emery.
5. Clinical Chemistry - Lawrence A.K. Amedeo J.P & Steven Manson’s Tropical Diseases - Manson – Bahr & Bell
6. Applied Nutrition - Dr. R. Rajaleshkmi.

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**I YEAR – II SEMESTER**

**CORE CODE: 7PBC2C3**

**CORE COURSE–IV - GUIDE PAPER-III -MEDICINAL HERBS AND PHYTOTHERAPEUTICS**

**Unit-I LIST OF MEDICINAL HERBS**

Explored medicinal herbs in varied geographical location. Phytochemical Classification and structure: Secondary metabolites significances of secondary metabolites; Flavonoids derivatives, Alkaloids subderivatives, Tannins, Phytochemical, Phenol, Phytosterols, proteins, Glycosides. Isolation, purification and characterization of Alkaloids, Flavonoids, Phenols, Tannins.

**Unit-II**

**Nanosynthesis**- products of Phytochemical as nanoparticles for drug delivery, clinical application in selected diseases. Biological synthesis of nanoparticles by fungi, bacteria, yeast and actinomycetes. Database similarity searching: BLAST, FASTA, sequence filters, PSI BLAST. Hidden Markov model.

**Unit-III**

Free radicals, types of free radicals released in metabolic events and its effects. Lipid peroxidation – chain reaction at cell membrane, mitochondrial double membrane. Antioxidant defense mechanism, Glutathione cycle, Vit.C defense cycle, Role of Selenium in defenses.

**Unit-IV**

Phytotherapeutics in rejuvenating organ function; Liver function, Kidney function, Blood pressure regulation, uterine function, Blood sugar regulation, Reduction of cholesterol synthesis, Production, function and Regulation of endocrine hormone:Pancreas, gonadal, Pituitary gland and Thyroid hormones. Anti-aging and Anti-inflammatory properties of phytochemicals.

**Unit-V**

Experimental animal models, rats, mice & rabbits; inbred strain; collection of different samples; whole blood, serum, organs etc., Routes of inductions for experimental preparations..Mechanism of action of Paracetamol, STZ, IST, ISO, Carageenum, CCl3, Alloxan. Animal Tissue Culture in research and phytotherapeutics invention.

**Books for Reference:**

1. Phytochemicals studies and analysis- Raman, 2nd Edn. , 2005.

2. Physiology by Rana Sindhe and Chatterjee.

3. Role of Biotechnology in Medicinal and Aromatic Plants, Volume-II, Irfen.A.Khan,Atiya

 Khanum

4. Medicinal plants in India, Indian Journal of Medical Research Seth S. D. Bhavana Sharma.

5. Antioxidants properties of some therapeutically active medicinal plant –an overview Gajera

 H. P. Patel Sr .Gdakiya

6. Fundamental concepts of Bioinformatics, Krane et al., 2002, Benjamin Cummins

7. Nanobiotechnology Molecular Diagnostics; Current Techniques and Applications, Jain, K. K.,

 2006. Taylor Francis.

8. Nano biotechnology in Biology and Medicine; Methods, Devices and applications, 2007. CRC

 Press.

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