ICMR – Regional Medical Research Centre, Port Blair
Notice on selection method and Syllabus for CBT for the recruitment of Technical officer – B posts

(Ref.: Advertisement No.: 1-18/Appoint/TO-B/2023/RMRC/PB/458 Dated: 15th Sept 2023)

Dated: 09th January 2024

Selections will be done on merit, based on marks obtained in CBT (computer based test) plus marks obtained in mandatory interview.

The scheme of marks for CBT and interview shall be as under:

Computer Based Test	Interview	Total
80 marks	20 marks	100 marks

Computer Based Test:

- The Computer Based Test (CBT) will consist of eighty (80) multiple choice questions (objective type).
- Each question shall carry one mark (01).
- There will be negative marking to the extent of 0.25 marks, for each wrong answer to the objective type questions in the CBT.
- Out of 80, 60 Questions will be related to the relevant subject. For Example: A candidate with post-graduation in Entomology will get 60 subject specific questions from entomology subject.
- And 20 Questions will be related to Computing skills, General Scientific Knowledge, Current Affairs including developments in Biomedical Sciences, Common Sense, Analytical Skills, Statistics, and General Awareness.
- Duration of the CBT shall be 80 minutes.
- Syllabus for the CBT is available on institute's website: http://www.rmrc.res.in/ .

Qualifying criteria:

1. The minimum qualifying/eligibility criteria for CBT will be 50%
2. On the basis of Computer Based Examination, candidates will be shortlisted, for further recruitment process i.e. scrutiny of their applications and documents, to decide their eligibility, as per applicable recruitment rules of the concerned post and interview by using the below mentioned criteria.

Number of candidates that will be short listed = 5 X No. of vacancies advertised + ties i.e. for each advertised post, five candidates (plus ties) will be shortlisted.

The result of the CBT for short listing of the candidates will be uploaded through a notice on the website of the Institute.

3. A candidate who is found eligible upon scrutiny of his/her application & documents shall only be considered for further recruitment process i.e. for interview. Final selection of the candidates, who is found eligible, as per recruitment rules and whose

certificates in support of age, caste, educational qualification, etc. found in order, will be made on merit, based on his/her aggregate scores in the CBT and interview.

Please Note:

Details on date, venue, and timings of CBT will be published on the institute's website: http://www.rmrc.res.in/ and eligible candidates will be intimated through email. Candidates are advised to visit the institute's website for further updates.

ADMINISTRATIVE OFFICER

/ For DIRECTOR

ICMR – Regional Medical Research Centre, Port Blair
Syllabus for CBT for the recruitment of Technical officer – B posts
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SUBJECT SPECIALIZATION: MICROBIOLOGY

Sr No	Subject	Level	Topic	Sub Topics
1	Microbiology	Post-Graduate	FUNDAMENTALS OF MICROBIOLOGY	The historical foundations and development of microbiology. An overview of microbial world. - Prokaryotic and eukaryotic cell and organelles and its functions. Outline classification of microorganisms- Haeckel three Kingdom classification, Whittaker five Kingdom classification, and Woese three domain classification,
2	Microbiology	Post-Graduate	FUNDAMENTALS OF MICROBIOLOGY	General characters of bacteria and the archaea. Cultivation of bacteria- culture media- Simple media, Differential media, Special media, enriched media, enrichment media and methods-aerobic and anaerobic media.
3	Microbiology	Post-Graduate	FUNDAMENTALS OF MICROBIOLOGY	Morphology and structure of bacteria-size shape, structure and arrangement, cultural characteristics. Surface structures and inclusions of bacteria-cell wall, cell membrane, cell organelles, genetic material, plasmid, spore, inclusion bodies. Microbial locomotion - flagellar motility, gliding motility and amoeboid motion. Chemotaxis, Phototaxis and other taxes. Identification of bacteria.
4	Microbiology	Post-Graduate	FUNDAMENTALS OF MICROBIOLOGY	Sterilization - Principles and methods, physical and chemical methods. Disinfectants - modes of action. Testing of disinfectants. dilution test, phenol-coefficient test. Antibiotics -Antibacterial, antifungal, antiviral, mechanism of action. Classification of antibiotics based on mechanism of action. Drug resistance in bacteria. Antibiotic sensitivity tests. disc method, well method and MIC.
5	Microbiology	Post-Graduate	FUNDAMENTALS OF MICROBIOLOGY	Genetic materials in bacteria. Bacterial chromosome. Extrachromosomal genetic elements. Plasmid- copy number and incompatibility, Replication of plasmid. Episomes. Transposable element-IS element and transposon, Integrons and Antibiotic resistance cassettes, Multiple antibiotic resistant bacteria, Mutation-types of mutations, DNA repair-Photolysis, Excision repair, NER, SOS repair, Mutant selection. Mechanism of

				gene transfer - transformation, transduction and conjugation. Recombination- types, mechanism and enzyme involved. Gene mapping. Genetic system in Yeast & Neurospora.
6	Microbiology	Post-Graduate	FUNDAMENTALS OF BIOCHEMISTRY	Oligosaccharides: Glycosidic bonds; Classification: glycoproteins (O-linked and N-linked); glycolipids; Nature of carbohydrate moiety attached; Function- as cell recognition factors, in intracellular targeting.
7	Microbiology	Post-Graduate	FUNDAMENTALS OF BIOCHEMISTRY	Glycerophospholipids: Structure and function of (Phosphatidic acid, cardiolipin, Phosphatidyl serine, Phosphatidyl ethanolamine, PhosphatidylGlycerol, Phosphatidylcholine, Phosphatidyl inositol, plasmalogens) CDP-diacylglycerol, Lung surfactants. Lipoproteins.
8	Microbiology	Post-Graduate	FUNDAMENTALS OF BIOCHEMISTRY	Macromolecular interactions: Protein - DNA interaction-helix turn helix, helix loop helix, zinc fingers, homeo box. Other DNA binding proteins.
9	Microbiology	Post-Graduate	FUNDAMENTALS OF BIOCHEMISTRY	Glycosphingolipids: Structure and function of (Sphingosine, ceramides & sphingomyelins, cerebrosides, globosides, gangliosides, sulfatides)
10	Microbiology	Post-Graduate	FUNDAMENTALS OF BIOCHEMISTRY	Steroids:Classification, structure and functions. Animal, plant and microbial steroids.
11	Microbiology	Post-Graduate	ANALYTICAL TECHNIQUES, BIOSTATISTICS AND BIOINFORMATICS	Microscopic and Spectroscopic techniques Principle, instrumentation and applications of light microscopy, Bright field, darkfield, phase contrast, fluorescence microscopyand confocal microscopy. Scanning and transmission electron microscopy.
12	Microbiology	Post-Graduate	ANALYTICAL TECHNIQUES, BIOSTATISTICS AND BIOINFORMATICS	Hydrodynamic techniques Principle, instrumentation, methods and application of adsorption and partition chromatography-Paper chromatography, Thin layer chromatography. Gel filtration chromatography, Affinity chromatography, Ion–exchange chromatography, HPLC.
13	Microbiology	Post-Graduate	ANALYTICAL TECHNIQUES, BIOSTATISTICS AND BIOINFORMATICS	Centrifugation- Principle, methods and applications of Ultra-centrifugation; differential and density gradient centrifugation.
14	Microbiology	Post-Graduate	ANALYTICAL TECHNIQUES, BIOSTATISTICS AND BIOINFORMATICS	Electrophoretic and blotting techniques Principle, instrumentation, methods and applications of electrophoresis; Gel electrophoresis- Polyacrylamide gel

				electrophoresis, SDS-PAGE, isoelectric focusing, agarose gel electrophoresis.
15	Microbiology	Post-Graduate	ANALYTICAL TECHNIQUES, BIOSTATISTICS AND BIOINFORMATICS	Module IV Biostatistics- Introduction, scope, probability and probability distribution analysis, variables in biology, collection, classification and tabulation of data, graphical and diagrammatic representations, Descriptive statistics, measures of central tendency- Arithmetic mean, median, mode, geometric mean, harmonic means.
16	Microbiology	Post-Graduate	ANALYTICAL TECHNIQUES, BIOSTATISTICS AND BIOINFORMATICS	Module V Bioinformatics Scope of bioinformatics, History and development, major biological data bases and its classification - sequence databases, structural data bases, derived and specialized data bases, genomic databases, sequence and structure file formats, creating databases, Data organisation, Searching data bases.
17	Microbiology	Post-Graduate	IMMUNOLOGY	History and scope of Immunology, Infection- Source of infection, Methods of transmission. Immunity, Types of immunity- innate, acquired, passive and active. Mechanisms of innate immunity- barriers, inflammation, phagocytosis- mechanisms, Pattern recognition receptors- Soluble (Antimicrobial peptides, CRP, MBL) and Membrane associated (TLR, Scavenger, NOD). Cells and organs of the immune system.
18	Microbiology	Post-Graduate	IMMUNOLOGY	Antigens- types, haptens, epitopes, Immunoglobulin - structure, classes and functions Fc receptors. Monoclonal antibodies- production and application, Antibody engineering. Antigenic determinants on Ig- Isotype, Allotype, Idiotype. Genetic basis of antibody diversity, Organization and Expression of Immunoglobulin, Genes, V(D)J rearrangements; somatic hypermutation affinity maturation, and class-switching, Antigen-antibody reactions, Agglutination, Precipitation, Complement fixation, Radioimmuno assay, Immunoflourescence, ELISA, Western blotting.
19	Microbiology	Post-Graduate	IMMUNOLOGY	Transplantation immunology: Immunologic basis of graft rejection, clinical manifestations of graft rejection, tissue typing, immunosuppressive therapy. Immunology of malignancy- Tumor antigens, Immune response in malignancy, Immunotherapy of cancer,

				Immunohematology- ABO and Rh blood group system, Immunology of blood transfusion, Hemolytic disease of new born.
20	Microbiology	Post-Graduate	IMMUNOLOGY	Immunological Tolerance, Autoimmunity- Mechanisms of autoimmunity, Autoimmune disorders- Organ specific and systemic autoimmune diseases. Hypersensitivity- immediate and delayed reactions, Immunodeficiency diseases- Primary and secondary immunodeficiency diseases, Vaccines -types of vaccines.
21	Microbiology	Post-Graduate	IMMUNOLOGY	Complement system, Complement activation, regulation, Biological effects of complements, MHC, Antigen processing and presentation, Receptors on T and B cells for antigen recognition, B cell-generation, activation, differentiation, Humoral Immune response- Primary and secondary immune response, Antibody formation, Clonal selection theory. T-cell maturation, activation and differentiation, Cell mediated Immune response, T-Cell subsets, Cytokines.
22	Microbiology	Post-Graduate	MOLECULAR BIOLOGY & RECOMBINANT DNA TECHNOLOGY	DNA Replication- Chromosomes, Process of DNA replication, Semiconservative, discontinuous uni and bidirectional, Okazaki fragments, DNA polymerases in eukaryotes and prokaryotes, Klenow fragment, modes of replication, theta, rolling circle, D-loop replication, Primosome, SSB, Helicase, Ligase, methylation and control, repetitive DNA sequences, minisatellite, microsatellite, DNA protein interaction, DNA Linking number and topoisomerase, Inhibition of replication.
23	Microbiology	Post-Graduate	MOLECULAR BIOLOGY & RECOMBINANT DNA TECHNOLOGY	Transcription-Process of transcription, stages in transcription, RNA polymerases in prokaryotes and eukaryotes, sigma factor in prokaryotes, Rho dependent and Rho independent termination. Enhancers, Transcription factors in Eukaryotes, Differences in transcription between prokaryotes and Eukaryotes, post transcriptional modifications,
24	Microbiology	Post-Graduate	MOLECULAR BIOLOGY & RECOMBINANT DNA TECHNOLOGY	Translation - Process of translation. Stages in translation, genetic code, properties, wobble hypothesis, eukaryotes and prokaryotes ribosomes, mRNAs, tRNAs, aminoacyl t-RNA synthetases, protein factors initiation complex, peptidyltransferases, releasing factors, differences between prokaryotic and eukaryotic systems, inhibition of translation. Post translation modification by cleavage, self-assembly, assisted self-

				assembly chaperones, acylation, phosphorylation, acetylation and glycosylation. Histone acetylation and deacetylases, chromosome remodelling complex. Intein splicing. Protein targeting, cotranslational import, post translational import, SRP-structure and function, Blobel's concept, Lysosome targeting, M6P address Glycosylation, core glycosylation terminal glycosylation, Dolichol phosphate. Targeting to nucleus, peroxisomes, chloroplast and mitochondria.
25	Microbiology	Post-Graduate	MOLECULAR BIOLOGY & RECOMBINANT DNA TECHNOLOGY	Tools and techniques for genetic Engineering - History of rDNA Technology, Cohen and Boyer Patents, Isolation of DNA and RNA from different sources, enzymes used in genetic engineering with special reference to restriction enzymes, ligases, and other DNA modifying enzymes. Modification of restriction fragments, vaccinia topoisomerases, TA cloning, and homopolymer tailing.
26	Microbiology	Post-Graduate	MOLECULAR BIOLOGY & RECOMBINANT DNA TECHNOLOGY	Applications of Genetic Engineering - Applications of transgenic Technology Improving quality and storage life of fruits and vegetables. Plants with novel features, Pharming. Animal cloning, Ethics of cloning. Applications of Molecular Biology in forensic sciences, medical science, archeology and paleontology.
27	Microbiology	Post-Graduate	MICROBIAL PHYSIOLOGY AND METABOLISM	Growth, division and solute transport Measurement of growth, growth physiology- nutritional types and factors influencing, cell division, growth yields, growth kinetics, steady state growth and continuous growth. Primary and Secondary transport - Introduction, Kinetics, ABC transporters, Phosphotransferase system, Drug export systems, amino acid transport.
28	Microbiology	Post-Graduate	MICROBIAL PHYSIOLOGY AND METABOLISM	Physiological adaptations and intracellular signaling Introduction to two component system, regulatory systems during aerobic-anaerobic shifts- Arc, Fnr, Nar, FhlA regulon, response to phosphate supply- The Pho regulon, Quorum sensing- A and C signaling system, Heat-Shock responses, pH homeostasis, osmotic homeostasis.
29	Microbiology	Post-Graduate	MICROBIAL PHYSIOLOGY AND METABOLISM	Central Metabolic pathways and regulation Glycolysis, PPP, ED pathway, Citric acid cycle: Electron transport and oxidative phosphorylation, efficiency of aerobic and anaerobic respiration as energy yielding processes. Branched TCA and Reverse TCA, glyoxylate cycle. Fermentative

				pathways in specific group of microbes: alcoholic, lactic acid, formic, mixed, propionic, butyric, butanol, butanediol. Utilization of sugars other than glucose and complex polysaccharides. Photosynthesis: Major groups of photosynthetic prokaryotic microbes. Ultrastructure of reaction center, arrangements of light harvesting pigments, light reaction & electron flow in photosynthesis. CO2 fixation pathways.
30	Microbiology	Post-Graduate	MICROBIAL PHYSIOLOGY AND METABOLISM	Central Metabolic pathways and regulation Glycolysis, PPP, ED pathway, Citric acid cycle: Electron transport and oxidative phosphorylation, efficiency of aerobic and anaerobic respiration as energy yielding processes. Branched TCA and Reverse TCA, glyoxylate cycle. Fermentative pathways in specific group of microbes: alcoholic, lactic acid, formic, mixed, propionic, butyric, butanol, butanediol. Utilization of sugars other than glucose and complex polysaccharides. Photosynthesis: Major groups of photosynthetic prokaryotic microbes. Ultrastructure of reaction center, arrangements of light harvesting pigments, light reaction & electron flow in photosynthesis. CO2 fixation pathways.
31	Microbiology	Post-Graduate	MICROBIAL PHYSIOLOGY AND METABOLISM	Metabolism of proteins and nucleic acids Biosynthesis of amino acids, catabolism of amino acids (deamination, decarboxylation and transamination), lysine and glutamine overproduction, stringent response, polyamine biosynthesis and regulation. protein degradation – exo and endo proteases. Purine and pyrimidine biosynthesis, regulation of purine and pyrimidine biosynthesis, inhibitors of nucleotide synthesis.
32	Microbiology	Post-Graduate	FOOD AND INDUSTRIAL MICROBIOLOGY	Incidence and type of microorganisms in food and milk. Contamination and Spoilage of food and milk, Principles of food preservations. Analysis of microbial quality of food and milk. Preservation and preparation of milk products. Fermented food products and beverages.
33	Microbiology	Post-Graduate	FOOD AND INDUSTRIAL MICROBIOLOGY	Lactic Acid Bacteria- homo and heterolactic fermentations and application. Probiotics, Prebiotics, Synbiotics, Nutraceuticals, Single cell protein, Production of edible mushroom, Food poisoning - Food borne diseases, Newer pathogens and emerging foodborne diseases. Indicators of food microbial quality: Coliforms, Enterococci, Bifidobacteria, Coliphages and Enteroviruses, Food safety management-HACCP.

34	Microbiology	Post-Graduate	FOOD AND INDUSTRIAL MICROBIOLOGY	Introduction to microbes in industrial processes. Isolation and screening of industrially usefulmicroorganisms, Primary and secondary screening, Strain improvement in industrial microbiology; improvement of characters other than product yield. Preservation of strains
35	Microbiology	Post-Graduate	FOOD AND INDUSTRIAL MICROBIOLOGY	Design of a fermentor, instrumentation and process control; Types of fermentors. Types of fermentations: aerobic and anaerobic; Submerged and Solid State; Dual. Fermentation media formulation and modification. Kinetics of growth in batch, continuous, fed-batch fermentation, Fermentation process: Inoculum preparation, Scaling up of fermentation, Assayof fermentation products (physical, chemical and biological assay). Downstream processing.
36	Microbiology	Post-Graduate	FOOD AND INDUSTRIAL MICROBIOLOGY	Microbes in the production (microbial strains, substrate, flow diagrams, product optimization, and applications) of the following: Industrial alcohol; organic acids, amino acids, alkaloids, vitamins; antibiotics. Microbial transformations of steroids.
37	Microbiology	Post-Graduate	ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY	Aerobiology- Microbial contamination of air - Sources of contamination- Microbial indicators of air pollution. Enumeration of bacteria in air, Air sampling devices. Air sanitation. Effect of Air Pollution on plants and Human.
38	Microbiology	Post-Graduate	ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY	Aquatic microbiology: Microbiology of water - Water pollution and water borne pathogens - Bacteriological examination of water - Indicator organisms. Purification and disinfection of water Microbiology of sewage - Waste water treatment - BOD, COD. Role of microbes in marine fouling
39	Microbiology	Post-Graduate	ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY	Microbial flora of soil and factors affecting them, Bio geochemical cycling - Nitrogen, Carbon, Phosphorus, Sulphur cycles and its importance.
40	Microbiology	Post-Graduate	ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY	Microbial interaction - Plant-microbe, microbe-microbe interactions. Mycorhizzae, Biological Nitrogen fixers- Symbiotic and free living nitrogen fixers- physiology and genetics of nitrogen fixers, Phosphate solubilizers, Phytopathogens - Bacterial, fungal, Viral diseases. (Wilt, Blight, Canker, Mosaic) - Control measures. Biofertilizers, Microbial control of pests and diseases. Integrated pest management. GM crops and its importance.

41	Microbiology	Post-Graduate	ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY	Recycling of liquid and soild wastes - Composting - Biogas - Biodegradation. Bioremediation, Xenobiotic degradation. Microbial corrosion- Biofilms degradation of petroleum products. Microbes in mineral leaching and metal concentration, Microbial enhanced oilrecovery.
42	Microbiology	Post-Graduate	MICROBIAL DIVERSIY AND EXTREMOPHILES	Introduction to Microbial biodiversity: distribution, abundance& ecological niche. Classes:Eubacteria, Archae and Eucarya. Molecular techniques for studying microbial biodiversity - use of DNA probes, markers, Expressed sequence tagging (EST), Denatured Gradient Gel electrophoresis, RFLP, RAPD, MALDI-TOF, Fluorescent in situ hybridization (FISH).Prospecting of marine microbial resources: Metagenomics.
43	Microbiology	Post-Graduate	MICROBIAL DIVERSIY AND EXTREMOPHILES	Psychrophiles and Thermophiles: characteristics and classification of Thermophiles: habitats and ecological aspects. Extremely Thermophilic Archaebacteria, Applications of thermozymes. Psychrophilicarchaeal extremozymes. Methanogens: Characteristics, classification, habitats and applications.
44	Microbiology	Post-Graduate	MICROBIAL DIVERSIY AND EXTREMOPHILES	Alkalophiles and Acidophiles: characteristics, classification, habitat and life in alkaline environments- soda lakes and deserts. Calcium alkalophily. Characteristics of acidophiles: classification, life at low pH, acidotolerence. Applications of alkalophiles and acidophiles.
45	Microbiology	Post-Graduate	MICROBIAL DIVERSIY AND EXTREMOPHILES	Halophiles and Barophiles: characteristics, classification and habitat- Dead Sea, discovery basin. Mechanism of osmoadaptation& halotolerence: cell walls and membranes, Purple membrane, compatible solutes. Applications of halophiles and their extremozymes. Barophiles: Classification, high-pressure habitats, life under pressure, barophily, death under pressure.
46	Microbiology	Post-Graduate	MICROBIAL DIVERSIY AND EXTREMOPHILES	Space Microbiology [Exomicrobiology]: Aims and objectives of space research. Life detection methods (a) Evidence of metabolism (Gulliver) (b) Evidence of photosynthesis (autotrophic and heterotrophic) (c) ATP production (d) Phosphate uptake (e) Sulphur uptake. Monitoring of astronauts microbial flora.
47	Microbiology	Post-Graduate	MARINE MICROBIOLOGY	Marine Microbial flora: Marine environment - sea-benthic & littoral zone, salt pan, mangroves and estuarine microbes, microbial loop - marine microbial community - planktons, bacteria, fungi, protozoa Methods of collection and estimation of marine microbes. Influence

				of physical, chemical and biological factors on marine microbes.
48	Microbiology	Post-Graduate	MARINE MICROBIOLOGY	Marine Adaptability: Survival at extreme environments - starvation - adaptive mechanisms in thermophilic, alkalophilic, osmophilic and barophilic, psychrophilic microorganisms - hyperthermophiles and halophiles
49	Microbiology	Post-Graduate	MARINE MICROBIOLOGY	Marine Microbial Disease: Marine food borne pathogens &Water borne pathogens - Aeromonas, Vibrio, Salmonella, Pseudomonas, .
50	Microbiology	Post-Graduate	MARINE MICROBIOLOGY	Marine Pollution: Microbial indicators of marine pollution and control - biofouling, biocorrosion, biofilms and bioremediation
51	Microbiology	Post-Graduate	MARINE MICROBIOLOGY	Marine Microbial Biotechnology: Marine natural products, valuable chemicals, bioactive compounds from marine microorganisms, marine bio-sensor and transgenic marine organisms. Biosurfactants, biopolymers and novel enzymes from marine organisms.
52	Microbiology	Post-Graduate	MICROBIAL QUALITY ASSURANCE, BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS	Bioethics - Principles of Bioethics; Belmont Report on protection of human beings on biomedical and behavioural research: respect for persons, beneficence, justice, etc.; Bioethic committees; professional ethics- medical, euthanasia; Public perception of process of biotechnology involved in generation new forms of life; example: ethical issues related to creations of Dolly and on reproductive cloning- Human Fertilization and Embryology Act & Cloning Prohibition Bill 1997
53	Microbiology	Post-Graduate	MICROBIAL QUALITY ASSURANCE, BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS	Biosafety and Genetically Modified Organisms - Guidelines on biosafety in conducting research in biology / biotechnology; Ethics in use of animals for scientific research; Ethical clearance norms for conducting studies on human subjects; Definition of GMOs & LMOs; Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture; Biosafety regulatory framework for GMOs at international level: Cartagena protocol on Biosafety; Advanced Information Agreement (AIA) procedure - procedures for GMOs intended for direct use, risk assessment, handling, transport, packaging and identification of GMOs. National Environment Policy.

54	Microbiology	Post-Graduate	MICROBIAL QUALITY ASSURANCE, BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS	Food safety and Quality assurance - Food safety- issues and factors affecting. Shelf life of Food Products- factors affecting shelf life and methods to check the shelf life. Food laws and regulations- National food legislation/ authorities and their role, product certifications (ISI mark of BIS), international organization and agreements- food and agricultural organization (FAO), world health organization (WHO), codex alimentarius, codex India, world international organization for standardization (ISO) Food safety and quality management systems: general principle of food safety, risk management, hazard analysis critical control point system (HACCP), Food Packaging: Need, material used and labelling.
55	Microbiology	Post-Graduate	MICROBIAL QUALITY ASSURANCE, BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS	IPR -Introduction to IPRs, Basic concepts and need for protection of Intellectual Property Types of IP: International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India
56	Microbiology	Post-Graduate	MICROBIAL QUALITY ASSURANCE, BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS	Procedure for filing a PCT application, forms of patents and patentability, The patentability of microorganisms, process and product patenting, Indian and international agencies involved in IPR & patenting, Patent databases, Patent infringement. Traditional knowledgeand Patent law for protection; Geographical Indicators.
57	Microbiology	Post-Graduate	MOLECULAR MICROBIOLOGY	Phylogenetic overview of bacteria and archaea, Molecular biology of microbial evolution, rRNAsequence and cellular evolution, Signature sequences and phylogenetic probe. Identification and characterization of microorganisms. Molecular typing methods: Bacterial strain typing, Pulsed Field Gel Electrophoresis, PCR-based microbial typing, Genotyping by Variable Number Tandem Repeats, Multilocus Sequence Typing, Automated Ribotyping, Molecular subtyping for epidemiology.
58	Microbiology	Post-Graduate	MOLECULAR MICROBIOLOGY	Genome wide approach to study prokaryotic biology, Microbial genome - comparison of genome size, Insight from genome of E.coli, Streptomyces coelicolor and Neurospora crassa. Unculturable bacteria and Metagenomics. Bacterial differentiation and molecular basis of endospore formation, Microbial stress response, Microbes in special habitat: Bacterial biofilm, molecular basis of biofilm development, biofilm dispersal strategies, biofilm in infection, quorum sensing. Extremophiles, molecular

				adaptation to extreme environment. Endophytes -metabolite diversity.
59	Microbiology	Post-Graduate	MOLECULAR MICROBIOLOGY	Molecular basis of microbial virulence. Bacterial adherence: basic principles, effects of adhesion on bacteria and host cells. Bacterial invasion of host cells; mechanism. Bacterial toxins: classification based on molecular features, Identification of novel toxins by genome mining, Application of bacterial toxin in cell biology and pharmacology.
60	Microbiology	Post-Graduate	MOLECULAR MICROBIOLOGY	Microbial induction of apoptosis. Molecular and visual clinical diagnosis methods. Molecular detection and characterization of bacterial pathogens, detection of bioterrorism. Laboratory controls and standards in molecular diagnostics.
61	Microbiology	Post-Graduate	Computing Skills	Fundamentals of Computer
62	Microbiology	Post-Graduate	Computing Skills	Communicating using the internet
63	Microbiology	Post-Graduate	Computing Skills	Online Security and Privacy
64	Microbiology	Post-Graduate	Computing Skills	Programming Basics
65	Microbiology	Post-Graduate	General / Scientific Knowledge	Human Body
66	Microbiology	Post-Graduate	General / Scientific Knowledge	Basics Chemistry
67	Microbiology	Post-Graduate	General / Scientific Knowledge	Basics physics
68	Microbiology	Post-Graduate	General / Scientific Knowledge	Basic biology
69	Microbiology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Psychological processes and disorders.

70	Microbiology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Neurophysiology
71	Microbiology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Cellular and systems physiology.
72	Microbiology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Genetics and developmental biology
73	Microbiology	Post-Graduate	Common Senses	Last figure to complete the series
74	Microbiology	Post-Graduate	Common Senses	Analogy/Series completion/Blood Relations
75	Microbiology	Post-Graduate	Analyticial Skills	Seating arrangment/Basic numerical operations/ Odd man out
76	Microbiology	Post-Graduate	Analyticial Skills	Coded operations of numbers
77	Microbiology	Post-Graduate	Statistics	Measures of Central Tendency (Mean Median Mode etc)
78	Microbiology	Post-Graduate	Statistics	Weighted Arithmetic Mean
79	Microbiology	Post-Graduate	General Awareness	Indian History/Geography
80	Microbiology	Post-Graduate	General Awareness	Indian festivals/sports

SUBJECT SPECIALIZATION: PHARMACY

Sr No	Subject	Level	Topic	Sub Topics
1	Pharmacy	Post-Graduate	MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES	UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV- Visible spectroscopy. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy
2	Pharmacy	Post-Graduate	MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES	Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instru- mentation and Applications of fluorescence spectrophotometer. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.
3	Pharmacy	Post-Graduate	MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES	NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Sol- vent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnet- ic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy.
4	Pharmacy	Post-Graduate	MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: a) Paper chromatography b) Thin Layer chromatography c) Ion exchange chromatography d) Column chromatography e) Gas chromatography f) High Performance Liquid chromatography g) Affinity chromatography
5	Pharmacy	Post-Graduate	MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES	Immunological assays : RIA (Radio immuno assay), ELISA, Bioluminescence assays.
6	Pharmacy	Post-Graduate	DRUG DELIVERY SYSTEMS	Sustained Release (SR) and Controlled Release (CR) formulations: Introduction & basic con- cepts, advantages/ disadvantages, factors influencing, Physicochemical & biological approaches for SR/CR formulation, Mechanism of Drug Delivery from SR/CR formulation. Polymers: intro- duction, definition, classification, properties and application Dosage Forms for

				Personalized Medicine: Introduction, Definition, Pharmacogenetics, Categories of Patients for Personalized Medicines: Customized drug delivery systems, Bioelectronic Medicines, 3D printing of pharma- ceuticals, Telepharmacy.
7	Pharmacy	Post-Graduate	DRUG DELIVERY SYSTEMS	Rate Controlled Drug Delivery Systems: Principles & Fundamentals, Types, Activation; Modu- lated Drug Delivery Systems; Mechanically activated, pH activated, Enzyme activated, and Os- motic activated Drug Delivery Systems Feedback regulated Drug Delivery Systems; Principles & Fundamentals.
8	Pharmacy	Post-Graduate	DRUG DELIVERY SYSTEMS	Gastro-Retentive Drug Delivery Systems: Principle, concepts advantages and disadvantages, Modulation of GI transit time approaches to extend GI transit. Buccal Drug Delivery Systems: Principle of muco adhesion, advantages and disadvantages, Mechanism of drug permeation, Methods of formulation and its evaluations.
9	Pharmacy	Post-Graduate	DRUG DELIVERY SYSTEMS	Protein and Peptide Delivery: Barriers for protein delivery. Formulation and Evaluation of de- livery systems of proteins and other macromolecules.
10	Pharmacy	Post-Graduate	DRUG DELIVERY SYSTEMS	Vaccine delivery systems: Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines.
11	Pharmacy	Post-Graduate	MODERN PHARMACEUTICS	Preformulation Concepts – Drug Excipient interactions - different methods, kinetics of sta- bility, Stability testing. Theories of dispersion and pharmaceutical Dispersion (Emulsion and Suspension, SMEDDS) preparation and stability Large and small volume parental – physio- logical and formulation consideration, Manufacturing and evaluation.
12	Pharmacy	Post-Graduate	MODERN PHARMACEUTICS	2. Validation: Introduction to Pharmaceutical Validation, Scope & merits of Validation, Validation and calibration of Master plan, ICH & WHO guidelines for calibration and validation of equip- ments, Validation of specific dosage form, Types of validation. Government regulation, Manu- facturing Process Model, URS, DQ, IQ, OQ & P.Q. of facilities.
13	Pharmacy	Post-Graduate	MODERN PHARMACEUTICS	3. cGMP & Industrial Management: Objectives and policies of current good manufacturing practices, layout of buildings, services, equipments and their maintenance Production manage- ment: Production organization, materials management, handling and transportation, invento- ry management and control, production and planning control, Sales forecasting, budget and cost control, industrial and personal

				relationship. Concept of Total Quality Management.
14	Pharmacy	Post-Graduate	MODERN PHARMACEUTICS	Compression and compaction: Physics of tablet compression, compression, consolidation, effect of friction, distribution of forces, compaction profiles. Solubility.
15	Pharmacy	Post-Graduate	MODERN PHARMACEUTICS	5. Study of consolidation parameters: Diffusion parameters, Dissolution parameters and Phar- macokinetic parameters, Heckel plots, Similarity factors – f2 and f1, Higuchi and Peppas plot, Linearity Concept of significance, Standard deviation, Chi square test, students T-test, ANOVA test.
16	Pharmacy	Post-Graduate	REGULATORY AFFAIRS	Documentation in Pharmaceutical Industry: Master formula record, DMF (Drug Master File), distribution records. Generic drugs product development Introduction, Hatch-Waxman act and amendments, CFR (CODE OF FEDERAL REGULATION), drug product performance, in-vitro, ANDA regulatory approval process, NDA approval process, BE and drug product as- sessment, in –vivo, scale up process approval changes, post marketing surveillance, out- sourcing BA and BE to CRO.
17	Pharmacy	Post-Graduate	REGULATORY AFFAIRS	CMC, post approval regulatory affairs: Regulation for combination products and medical de- vices.CTD and ECTD format, industry and FDA liaison. ICH - Guidelines of ICH-Q, S E, M. Reg- ulatory requirements of EU, MHRA, TGA and ROW countries.
18	Pharmacy	Post-Graduate	REGULATORY AFFAIRS	Non clinical drug development: Global submission of IND, NDA, ANDA. Investigation of medic- inal products dossier, dossier (IMPD) and investigator brochure (IB).
19	Pharmacy	Post-Graduate	REGULATORY AFFAIRS	Clinical trials: Developing clinical trial protocols. Institutional review board / independent ethics committee Formulation and working procedures informed Consent process and proce- dures. HIPAA-new, requirement to clinical study process, pharmacovigilance safety monitoring in clinical trials.
20	Pharmacy	Post-Graduate	REGULATORY AFFAIRS	Regulatory requirement for product approval: API, biologics, novel, therapies obtaining NDA, ANDA for generic drugs ways and means of US registration for foreign drugs
21	Pharmacy	Post-Graduate	MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS)	Targeted Drug Delivery Systems: Concepts, Events and biological process involved in drug targeting. Tumor targeting and Brain specific delivery.
22	Pharmacy	Post-Graduate	MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS)	Targeting Methods: introduction preparation and evaluation. Nano Particles & Liposomes: Types, preparation and evaluation.

23	Pharmacy	Post-Graduate	MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS)	Micro Capsules / Micro Spheres: Types, preparation and evaluation, Monoclonal Antibodies ; preparation and application, preparation and application of Niosomes, Aquasomes, Phyto- somes, Electrosomes
24	Pharmacy	Post-Graduate	MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS)	Pulmonary Drug Delivery Systems : Aerosols, propellents, ContainersTypes, preparation and evaluation, Intra Nasal Route Delivery systems; Types, preparation and evaluation.
25	Pharmacy	Post-Graduate	MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS)	Nucleic acid based therapeutic delivery system : Gene therapy, introduction (ex-vivo & in-vi- vo gene therapy). Potential target diseases for gene therapy (inherited disorder and cancer). Gene expression systems (viral and nonviral gene transfer). Liposomal gene delivery systems. Biodistribution and Pharmacokinetics. knowledge of therapeutic antisense molecules and aptamers as drugs of future.
26	Pharmacy	Post-Graduate	ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS	Drug Absorption from the Gastrointestinal Tract: Gastrointestinal tract, Mechanism of drug absorption, Factors affecting drug absorption, pH–partition theory of drug absorption. For- muulation and physicochemical factors: Dissolution rate, Dissolution process, Noyes–Whitney equation and drug dissolution, Factors affecting the dissolution rate. Gastrointestinal absorp- tion: role of the dosage form: Solution (elixir, syrup and solution) as a dosage form ,Suspen- sion as a dosage form, Capsule as a dosage form, Tablet as a dosage form, Dissolution meth- ods, Formulation and processing factors, Correlation of in vivo data with in vitro dissolution data. Transport model: Permeability-Solubility-Charge State and the pH Partition Hypothesis, Properties of the Gastrointestinal Tract (GIT), pH Microclimate Intracellular pH Environment, Tight-Junction Complex
27	Pharmacy	Post-Graduate	ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS	2. Biopharmaceutic considerations in drug product design and In Vitro Drug Product Perfor- mance: Introduction, biopharmaceutic factors affecting drug bioavailability, rate-limiting steps in drug absorption, physicochemical nature of the drug formulation factors affecting drug product performance, in vitro: dissolution and drug release testing, compendial methods of dissolution, alternative methods of dissolution testing,meeting dissolution requirements,prob- lems of variable control in dissolution testingperformance of drug products. In vitro–in vivo correlation, dissolution profile comparisons, drug product stability,considerations in the de- sign of a drug product.

28	Pharmacy	Post-Graduate	ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS	3. Pharmacokinetics: Basic considerations, pharmacokinetic models, compartment modeling: one compartment model- IV bolus, IV infusion, extra-vascular. Multi compartment model:two compartment - model in brief, non-linear pharmacokinetics: cause of non-linearity, Michaelis – Menten equation, estimation of kmax and vmax. Drug interactions: introduction, the effect of protein-binding interactions,the effect of tissue-binding interactions,cytochrome p 4 5 0 - based drug interactions, drug interactions linked to transporters.
29	Pharmacy	Post-Graduate	ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS	4. Drug Product Performance, In Vivo: Bioavailability and Bioequivalence: drug product per- formance, purpose of bioavailability studies, relative and absolute availability. methods for assessing bioavailability, bioequivalence studies, design and evaluation of bioequivalence studies, study designs, crossover study designs, evaluation of the data, bioequivalence example, study submission and drug review process. biopharmaceutics classification system, methods. Permeability: In-vitro, in-situ and In-vivo methods.generic biologics (biosimilar drug products),clinical significance of bioequivalence studies, special concerns in bioavailability and bioequivalence studies, generic substitution.
30	Pharmacy	Post-Graduate	ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS	5. Application of Pharmacokinetics: Modified-Release Drug Products, Targeted Drug Delivery Systems and Biotechnological Products. Introduction to Pharmacokinetics and pharmacody-namic, drug interactions. Pharmacokinetics and pharmacodynamics of biotechnology drugs. Introduc- tion, Proteins and peptides, Monoclonal antibodies, Oligonucleotides, Vaccines (immunotherapy), Gene therapies.
31	Pharmacy	Post-Graduate	COMPUTER AIDED DRUG DELIVERY SYSTEM	Computers in Pharmaceutical Research and Development: A General Overview: History of Computers in Pharmaceutical Research and Development. Statistical modeling in Pharma- ceutical research and development: Descriptive versus Mechanistic Modeling, Statistical Pa- rameters, Estimation, Confidence Regions, Nonlinearity at the Optimum, Sensitivity Analysis, Optimal Design, Population Modeling
32	Pharmacy	Post-Graduate	COMPUTER AIDED DRUG DELIVERY SYSTEM	Computational Modeling of Drug Disposition: Introduction, Modeling Techniques: Drug Ab- sorption, Solubility, Intestinal Permeation, Drug Distribution, Drug Excretion, Active Transport; P-gp, BCRP, Nucleoside Transporters, hPEPT1, ASBT, OCT, OATP, BBB-Choline Transporter.

33	Pharmacy	Post-Graduate	COMPUTER AIDED DRUG DELIVERY SYSTEM	Computer-aided formulation development: Concept of optimization, Optimization parame- ters, Factorial design, Optimization technology & Screening design. Computers in Pharmaceu- tical Formulation: Development of pharmaceutical emulsions, microemulsion drug carriers Legal Protection of Innovative Uses of Computers in R&D, The Ethics of Computing in Pharma- ceutical Research, Computers in Market analysis
34	Pharmacy	Post-Graduate	COMPUTER AIDED DRUG DELIVERY SYSTEM	Computer-aided biopharmaceutical characterization: Gastrointestinal absorption simula- tion. Introduction, Theoretical background, Model construction, Parameter sensitivity anal- ysis, Virtual trial, Fed vs. fasted state, In vitro dissolution and in vitro-in vivo correlation, Bio- waiver considerations
35	Pharmacy	Post-Graduate	COMPUTER AIDED DRUG DELIVERY SYSTEM	Artificial Intelligence (AI), Robotics and Computational fluid dynamics: General overview, Pharmaceutical Automation, Pharmaceutical applications, Advantages and Disadvantages. Current Challenges and Future Directions.
36	Pharmacy	Post-Graduate	COSMETICS AND COSMECEUTICALS	Cosmetics – Regulatory : Definition of cosmetic products as per Indian regulation. Indian regulatory requirements for labeling of cosmetics Regulatory provisions relating to import of cosmetics., Misbranded and spurious cosmetics. Regulatory provisions relating to manu- facture of cosmetics – Conditions for obtaining license, prohibition of manufacture and sale of certain cosmetics, loan license, offences and penalties.
37	Pharmacy	Post-Graduate	COSMETICS AND COSMECEUTICALS	Cosmetics - Biological aspects : Structure of skin relating to problems like dry skin, acne, pigmentation, prickly heat, wrinkles and body odor. Structure of hair and hair growth cycle. Common problems associated with oral cavity. Cleansing and care needs for face, eye lids, lips, hands, feet, nail, scalp, neck, body and under-arm.
38	Pharmacy	Post-Graduate	COSMETICS AND COSMECEUTICALS	Formulation Building blocks: Building blocks for different product formulations of cosmetics/ cosmeceuticals. Surfactants – Classification and application. Emollients, rheological additives: classification and application. Antimicrobial used as preservatives, their merits and demerits. Factors affecting microbial preservative efficacy. Building blocks for formulation of a moistur- izing cream, vanishing cream, cold cream, shampoo and toothpaste. Soaps and syndetbars.
39	Pharmacy	Post-Graduate	COSMETICS AND COSMECEUTICALS	Design of cosmeceutical products: Sun protection, sunscreens classification and regulatory aspects. Addressing dry skin, acne, sun-protection, pigmentation, prickly heat, wrinkles, body odor., dandruff, dental

				cavities, bleeding gums, mouth odor and sensitive teeth through cos- meceutical formulations.
40	Pharmacy	Post-Graduate	COSMETICS AND COSMECEUTICALS	Herbal Cosmetics: Herbal ingredients used in Hair care, skin care and oral care. Review of guidelines for herbal cosmetics by private bodies like cosmos with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics.
41	Pharmacy	Post-Graduate	ADVANCED MEDICINAL CHEMISTRY	Drug discovery: Stages of drug discovery, lead discovery; identification, validation and diver- sity of drug targets.
42	Pharmacy	Post-Graduate	ADVANCED MEDICINAL CHEMISTRY	Rational Design of Enzyme Inhibitors Enzyme kinetics & Principles of Enzyme inhibitors, Enzyme inhibitors in medicine, Enzyme inhibitors in basic research, rational design of non-covalently and covalently binding enzyme inhibitors.
43	Pharmacy	Post-Graduate	ADVANCED MEDICINAL CHEMISTRY	Peptidomimetics: Therapeutic values of Peptidomimetics, design of peptidomimetics by manipulation of the amino acids, modification of the peptide backbone, incorporating conformational constraints locally or globally. Chemistry of prostaglandins, leukotrienes and thromboxanes.
44	Pharmacy	Post-Graduate	ADVANCED MEDICINAL CHEMISTRY	Prodrug design: Basic concept, Carrier linked prodrugs/ Bioprecursors, Prodrugs of functional group, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distri- bution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design.
45	Pharmacy	Post-Graduate	ADVANCED MEDICINAL CHEMISTRY	Analog Design: Introduction, Classical & Non classical, Bioisosteric replacement strategies, rigid analogs, alteration of chain branching, changes in ring size, ring position isomers, design of stereo isomers and geometric isomers, fragments of a lead molecule, variation in inter atomic distance
46	Pharmacy	Post-Graduate	PHARMACEUTICAL PROCESS CHEMISTRY	Process chemistry: Introduction, Synthetic strategy Stages of scale up process: Bench, pilot and large scale process. In-process control and validation of large scale process. Case studies of some scale up process of APIs. Impurities in API, types and their sources including genotoxic impurities
47	Pharmacy	Post-Graduate	PHARMACEUTICAL PROCESS CHEMISTRY	Unit operations: a) Extraction: Liquid equilibria, extraction with reflux, extraction with agitation, counter current extraction. b) Filtration: Theory of filtration, pressure

				and vacuum filtration, centrifugal filtration, c) Distillation: azeotropic and steam distillation d) Evaporation: Types of evaporators, factors affecting evaporation. e) Crystallization: Crystallization from aqueous, non- aqueous solutions factors affecting crystal- lization, nucleation. Principle and general methods of Preparation of polymorphs, hydrates, solvates and amorphous APIs.
48	Pharmacy	Post-Graduate	PHARMACEUTICAL PROCESS CHEMISTRY	Unit Processes - I a) Nitration: Nitrating agents, Aromatic nitration, kinetics and mechanism of aromatic nitration, process equipment for technical nitration, mixed acid for nitration, b) Halogenation: Kinetics of halogenations, types of halogenations, catalytic halogenations. Case study on industrial halogenation process. c) Oxidation: Introduction, types of oxidative reactions, Liquid phase oxidation with oxidizing agents. Nonmetallic Oxidizing agents such as H2O2, sodium hypochlorite, Oxygen gas, ozono- lysis.
49	Pharmacy	Post-Graduate	PHARMACEUTICAL PROCESS CHEMISTRY	Industrial Safety a) MSDS (Material Safety Data Sheet), hazard labels of chemicals and Personal Protection Equip- ment (PPE) b) Fire hazards, types of fire & fire extinguishers c) Occupational Health & Safety Assessment Series 1800 (OHSAS-1800) and ISO-14001 (Environ- mental Management System), Effluents and its management
50	Pharmacy	Post-Graduate	PHARMACEUTICAL PROCESS CHEMISTRY	Unit Processes - II a) Reduction: Catalytic hydrogenation, Heterogeneous and homogeneous catalyst; Hydrogen transfer reactions, Metal hydrides. Case study on industrial reduction process. b) Fermentation: Aerobic and anaerobic fermentation. Production of i. Antibiotics; Penicillin and Streptomycin, ii. Vitamins: B2 and B12 iii. Statins: Lovastatin, Simvastatin c) Reaction progress kinetic analysis i. Streamlining reaction steps, route selection, ii. Characteristics of expedient routes, characteristics of cost-effective routes, reagent selection, families of reagents useful for scale-up.
51	Pharmacy	Post-Graduate	CLINICAL PHARMACY PRACTICE	Introduction to Clinical Pharmacy: Definition, evolution and scope of clinical pharmacy, International and national scenario of clinical pharmacy practice, Pharmaceutical care

				Clinical Pharmacy Services: Ward round participation, Drug therapy review (Drug therapy monitoring including medication order review, chart endorsement, clinical review and pharmacist interventions)
52	Pharmacy	Post-Graduate	CLINICAL PHARMACY PRACTICE	Clinical Pharmacy Services: Patient medication history interview, Basic concept of medicine and poison information services, Basic concept of pharmacovigilance, Hemovigilance, Materiovigilance and AEFI, Patient medication counselling, Drug utilisation evaluation, Documentation of clinical pharmacy services, Quality assurance of clinical pharmacy services.
53	Pharmacy	Post-Graduate	CLINICAL PHARMACY PRACTICE	Patient Data Analysis: Patient Data & Practice Skills: Patient's case history - its structure and significances in drug therapy management, Common medical abbreviations and terminologies used in clinical practice. Communication skills: verbal and non-verbal communications, its applications in patient care services.
54	Pharmacy	Post-Graduate	CLINICAL PHARMACY PRACTICE	Lab Data Interpretation: Tests associated with cardiac disorders, Pulmonary function tests, Thyroid function tests, Fluid and electrolyte balance, Microbiological culture sensitivity tests
55	Pharmacy	Post-Graduate	CLINICAL PHARMACY PRACTICE	Medicines & Poison Information Services Medicine Information Service: Definition and need for medicine information service, Medicine information resources, Systematic approach in answering medicine information queries, Preparation of verbal and written response, Establishing a drug information centre.
56	Pharmacy	Post-Graduate	PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS	Introduction to Pharmacoepidemiology: Definition, Scope, Need, Aims & Applications; 12 Hrs Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, M o n e t a r y units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio
57	Pharmacy	Post-Graduate	PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS	Introduction to Pharmacoeconomics: Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs.

				Outcomes and Measurements of Pharmacoeconomics: Typesof outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost Effective Ratio, Average Cost Effective Ratio. Person Time, Willingness To Pay, Time Trade Off and Discounting.
58	Pharmacy	Post-Graduate	PRINCIPLES OF QUALITY USE OF MEDICINES	Introduction to Quality use of medicines (QUM): Definition and Principles of QUM, Key partners and responsibilities of the partners, Building blocks in QMC, Evaluation process in QMC, Communication in QUM, Cost effective prescribing.
59	Pharmacy	Post-Graduate	PRINCIPLES OF QUALITY USE OF MEDICINES	Regulatory aspects of QUM in India: Regulation including scheduling, Regulation of complementary medicines, Regulation of OTC medicines, Professional responsibility of pharmacist, Role of industry in QUM in medicine development.
60	Pharmacy	Post-Graduate	PRINCIPLES OF QUALITY USE OF MEDICINES	Medication errors: Definition, categorization and causes of medication errors, Detection and prevention of medication errors, Role of pharmacist in monitoring and management of medication errors .
61	Pharmacy	Post-Graduate	Computing Skills	Fundamentals of Computer
62	Pharmacy	Post-Graduate	Computing Skills	Communicating using the internet
63	Pharmacy	Post-Graduate	Computing Skills	Online Security and Privacy
64	Pharmacy	Post-Graduate	Computing Skills	Programming Basics
65	Pharmacy	Post-Graduate	General / Scientific Knowledge	Human Body
66	Pharmacy	Post-Graduate	General / Scientific Knowledge	Basics Chemistry
67	Pharmacy	Post-Graduate	General / Scientific Knowledge	Basics physics

68	Pharmacy	Post-Graduate	General / Scientific Knowledge	Basic biology
69	Pharmacy	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Psychological processes and disorders.
70	Pharmacy	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Neurophysiology
71	Pharmacy	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Cellular and systems physiology.
72	Pharmacy	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Genetics and developmental biology
73	Pharmacy	Post-Graduate	Common Senses	Last figure to complete the series
74	Pharmacy	Post-Graduate	Common Senses	Analogy/Series completion/Blood Relations
75	Pharmacy	Post-Graduate	Analyticial Skills	Seating arrangment/Basic numerical operations/ Odd man out
76	Pharmacy	Post-Graduate	Analyticial Skills	Coded operations of numbers
77	Pharmacy	Post-Graduate	Statistics	Measures of Central Tendency (Mean Median Mode etc)
78	Pharmacy	Post-Graduate	Statistics	Weighted Arithmetic Mean
79	Pharmacy	Post-Graduate	General Awareness	Indian History/Geography
80	Pharmacy	Post-Graduate	General Awareness	Indian festivals/sports

SUBJECT SPECIALIZATION: ENTOMOLOGY

Sr No	Subject	Level	Topic	Sub Topics
1	Entomology	Post-Graduate	INSECT MORPHOLOGY	Principles, utility and relevance: insect body wall structure, cuticular outgrowths, colouration and special integumentary structures in insects, body tagmata, sclerites and segmentation.
2	Entomology	Post-Graduate	INSECT MORPHOLOGY	Head- Origin, structure and modification; types of mouthparts and antennae, tentorium and neck sclerites.
3	Entomology	Post-Graduate	INSECT MORPHOLOGY	Embryonic and post-embryonic development; Types of metamorphosis. Insect sense organs (mechano-, photo- and chemoreceptors).
4	Entomology	Post-Graduate	INSECT ANATOMY, PHYSIOLOGY AND NUTRITION	Scope and importance of insect anatomy and physiology.
5	Entomology	Post-Graduate	INSECT ANATOMY, PHYSIOLOGY AND NUTRITION	Structure, modification and physiology of different systems- digestive, circulatory, respiratory, excretory, nervous, sensory, reproductive, musculature, endocrine and exocrine glands.
6	Entomology	Post-Graduate	INSECT ANATOMY, PHYSIOLOGY AND NUTRITION	Insect nutrition- role of vitamins, proteins, amino acids, carbohydrates, lipids, minerals and other food constituents; extra and intra-cellular microorganisms and their role in physiology; artificial diets.
7	Entomology	Post-Graduate	PRINCIPLES OF TAXONOMY and CLASSIFICATION OF INSECTS	Introduction to history and principles of systematics and importance. Levels and functions of systematics. Identification, purpose, methodscharacter matrix, taxonomic keys. Descriptions-subjects of descriptions, characters, nature of characters, analogy vs homology, parallel vs convergent evolution, intraspecific variation in characters, polythetic and polymorphic taxa, sexual dimorphism
8	Entomology	Post-Graduate	PRINCIPLES OF TAXONOMY and CLASSIFICATION OF INSECTS	Classification of animals: Schools of classification- Phenetics, Cladistics and Evolutionary classification. Components of Biological Classification: Hierarchy, Rank, Category and Taxon. Species concepts, cryptic, sibling and etho-species, infra-specific categories. Introduction to numerical, biological and cytogenetical taxonomy.

9	Entomology	Post-Graduate	PRINCIPLES OF TAXONOMY and CLASSIFICATION OF INSECTS	Brief evolutionary history of Insects- introduction to phylogeny of insects and Major Classification of Superclass Hexapoda – C lasses – Ellipura (Collembola, Protura), Diplura and Insecta- Orders contained.
10	Entomology	Post-Graduate	PRINCIPLES OF TAXONOMY and CLASSIFICATION OF INSECTS	Distinguishing characters, general biology, habits and habitats of Insect orders and economically important families contained in them
11	Entomology	Post-Graduate	INSECT ECOLOGY	History and Definition. Basic Concepts. Organisation of the Biological world. Plato's Natural Balance vs Ecological Dynamics as the modern view. Abundance and diversity of insects, Estimates and Causal factors.
12	Entomology	Post-Graduate	INSECT ECOLOGY	Basic concepts of abundance- Model vs Real world. Population growthbasic models – Exponential vs Logistic models. Discrete v s Continuous growth models. Concepts of Carrying capacity, Environmental Resistance and Optimal yield. Vital Statistics- Life Tables and their application to insect biology. Survivorship curves. Case studies of insect life table
13	Entomology	Post-Graduate	INSECT ECOLOGY	Biotic factors- Food as a limiting factor for distribution and abundance, Nutritional Ecology. Food chain- web and ecological succession. Interspecific interactions- Basic factors governing the interspecific interactions- Classification of interspecific interactions - The argument of cost-benefit ratios.
14	Entomology	Post-Graduate	INSECT PATHOLOGY	History of insect pathology, infection of insects by bacteria, fungi, viruses, protozoa, rickettsiae, spiroplasma and nematodes.
15	Entomology	Post-Graduate	INSECT PATHOLOGY	Examples of successful instances of exploitation of pathogens for pest management and mass production techniques of pathogens. Safety and registration of microbial pesticides. Use of insect pathogens in integrated management of insect pests.
16	Entomology	Post-Graduate	BIOLOGICAL CONTROL OF CROP PESTS AND WEEDS	Biology, adaptation, host seeking behaviour of predatory and parasitic groups of insects. Role of insect pathogenic nematodes, viruses, bacteria, fungi, protozoa etc., their mode of action. Biological control of weeds using insects.
17	Entomology	Post-Graduate	BIOLOGICAL CONTROL OF CROP PESTS AND WEEDS	Mass production of quality biocontrol agents- techniques, formulations, economics, field release/application and evaluation.

18	Entomology	Post-Graduate	TOXICOLOGY OF INSECTICIDES	Definition and scope of insecticide toxicology; history of chemical control; pesticide use and pesticide industry in India.
19	Entomology	Post-Graduate	TOXICOLOGY OF INSECTICIDES	Principles of toxicology; evaluation of insecticide toxicity; joint action of insecticides- synergism, potentiation and antagonism; factors affecting toxicity of insecticides; insecticide compatibility, selectivity and phytotoxicity.
20	Entomology	Post-Graduate	TOXICOLOGY OF INSECTICIDES	Insecticide metabolism; pest resistance to insecticides; mechanisms and types of resistance; insecticide resistance management and pest resurgence
21	Entomology	Post-Graduate	PLANT RESISTANCE TO INSECTS	History and importance of resistance, principles, classification, components, types and mechanisms of resistance.
22	Entomology	Post-Graduate	PLANT RESISTANCE TO INSECTS	Factors affecting plant resistance including biotypes and measures to combat them.
23	Entomology	Post-Graduate	PLANT RESISTANCE TO INSECTS	Screening techniques; breeding for insect resistance in crop plants; exploitation of wild plant species; gene transfer, successful examples of resistant crop varieties in India and world.
24	Entomology	Post-Graduate	PRINCIPLES OF INTEGRATED PEST MANAGEMENT	History and origin, definition and evolution of various related terminologies.
25	Entomology	Post-Graduate	PRINCIPLES OF INTEGRATED PEST MANAGEMENT	Concept and philosophy, ecological principles, economic threshold concept, and economic consideration.
26	Entomology	Post-Graduate	PRINCIPLES OF INTEGRATED PEST MANAGEMENT	Tools of pest management and their integration- legislative, cultural, physical and mechanical methods; pest survey and surveillance, forecasting, types of surveys including remote sensing methods, factors affecting surveys;
27	Entomology	Post-Graduate	PESTS OF FIELD, HORTICULTURAL AND PLANTATION CROPS AND STORAGE ENTOMOLOGY	Insect pests of cereals and millets and their management. Polyphagous pests: grasshoppers, locusts, termites, white grubs, hairy caterpillars, and non-insect pests (mites, birds, rodents, snails, slugs etc.).
28	Entomology	Post-Graduate	PESTS OF FIELD, HORTICULTURAL AND PLANTATION CROPS AND STORAGE ENTOMOLOGY	Insect pests of fibre crops, forages, sugarcane and their management.

29	Entomology	Post-Graduate	PESTS OF FIELD, HORTICULTURAL AND PLANTATION CROPS AND STORAGE ENTOMOLOGY	Ornamental, medicinal and aromatic plants and pests in polyhouses/protected cultivation.
30	Entomology	Post-Graduate	PESTS OF FIELD, HORTICULTURAL AND PLANTATION CROPS AND STORAGE ENTOMOLOGY	Introduction, history of storage entomology, concepts of storage entomology and significance of insect pests. Post-harvest losses in toto visà-vis total production of food grains in India. Scientific and socio-economic factors responsible for grain losses.
31	Entomology	Post-Graduate	INSECT VECTORS OF PLANT VIRUSES AND OTHER PATHOGENS	History of developments in the area of insects as vectors of plant pathogens. Important insect vectors and their characteristics; mouth parts and feeding processes of important insect vectors. Efficiency of transmission.
32	Entomology	Post-Graduate	INSECT VECTORS OF PLANT VIRUSES AND OTHER PATHOGENS	Transmission of plant viruses and fungal pathogens. Relation between viruses and their vectors.
33	Entomology	Post-Graduate	INSECT VECTORS OF PLANT VIRUSES AND OTHER PATHOGENS	Transmission of plant viruses by psyllids, beetles and mites. Epidemiology and management of insect transmitted diseases through vector
34	Entomology	Post-Graduate	COMMERCIAL ENTOMOLOGY	Bee keeping- General colony management during different seasons. Seasonal management. Managing colonies for honey production and pollination. Artificial queen rearing. Pests and diseases of honey bees. Bee poisoning. Production and marketing of quality honey and value added honey products. Establishment and maintenance of apiaries.
35	Entomology	Post-Graduate	COMMERCIAL ENTOMOLOGY	Economic and public health importance of insect pests in human habitation and habitats, biology, damage and control of mosquitoes, houseflies, bed bugs, ants, termites, cockroaches, flies, silverfish, head and body lice, carpet beetles, cloth moths, crickets, wasps, house dust mites, insect pests of cattle, poultry, pet animals and their management.
36	Entomology	Post-Graduate	COMMERCIAL ENTOMOLOGY	Principles and methods of pest management in residential places and public buildings, insecticides for domestic use and their safety, pre- and postconstruction termite proofing of buildings, appliances for domestic pest control. Rodent control methods. Organic methods of domestic pest management.
37	Entomology	Post-Graduate	IMMATURE STAGES OF INSECTS	Types of immature stages in insect orders, morphology of egg, nymph/larva and pupa, identification of different immature stages of crop pests and stored product insects

38	Entomology	Post-Graduate	IMMATURE STAGES OF INSECTS	Comparative study of life history strategies in hemi-metabola and holometabola, immature stages as ecological and evolutionary adaptations, significance of immature stages for pest management.
39	Entomology	Post-Graduate	INSECT BEHAVIOUR	Defining Behaviour- Concept of umwelt, instinct, fixed action patterns, imprinting, complex behaviour, inducted behaviour, learnt behaviour and motivation. History of Ethology- development of behaviorism and ethology, contribution of Darwin, Frisch, Tinbergen and Lorenz; Studying behaviour- Proximate and Ultimate approaches, behavioural traits under natural selection, genetic control of behaviour and behavioural polymorphism.
40	Entomology	Post-Graduate	INSECT BEHAVIOUR	Orientation- Forms of primary and secondary orientation including taxes and kinesis; Communication- primary and secondary orientation, responses to environmental stimuli, role of visual, olfactory and auditory signals in inter- and intra-specific communication, use of signals in defense, mimicry, polyphenism; evolution of signals.
41	Entomology	Post-Graduate	INSECT BEHAVIOUR	Reproductive behaviour- mate finding, courtship, territoriality, parental care, parental investment, sexual selection and evolution of sex ratios; Social behaviour- kin selection, parental manipulation and mutualism; Selforganization and insect behaviour.
42	Entomology	Post-Graduate	ADVANCED INSECTICIDE TOXICOLOGY	Penetration and distribution of insecticides in insect systems; insecticide selectivity; factors affecting toxicity of insecticides.
43	Entomology	Post-Graduate	ADVANCED INSECTICIDE TOXICOLOGY	Biochemical and physiological target sites of insecticides in insects; developments in biorationals, biopesticides and newer molecules; their modes of action and structural – activity relations hips; advances in metabolism of insecticides.
44	Entomology	Post-Graduate	ADVANCED INSECTICIDE TOXICOLOGY	Joint action of insecticides; activation, synergism and potentiation.
45	Entomology	Post-Graduate	ADVANCED HOST PLANT RESISTANCE	Importance of plant resistance, historical perspective, desirable morphological, anatomical and biochemical adaptations of resistance; assembly of plant species - gene pool; insect sources – behaviour in relation to host plant factors.

46	Entomology	Post-Graduate	ADVANCED HOST PLANT RESISTANCE	Physical and chemical environment conferring resistance in plants, role of trypsin inhibitors and protease inhibitors in plant resistance; biochemistry of induced resistance – signal transduction pathway s, methyl jasmonate pathways, polyphenol oxidase pathways, salicylic acid pathways; effects of induced resistance; exogenous application of elicitors.
47	Entomology	Post-Graduate	ADVANCED HOST PLANT RESISTANCE	Biotechnological approaches in host plant resistance- genetic manipulation of secondary plant substances; incorporation of resistant gene in crop varieties; marker-aided selection in resistance breeding.
48	Entomology	Post-Graduate	ADVANCED ACAROLOGY	Comparative morphology of Acari, phylogeny of higher categories in mites, knowledge of commonly occurring orders and families of Acari in India. Diagnostic characteristics of commonly occurring species from families Tetranychidae, Tenuipalpidae, Eriophyidae, Tarsonemidae, Phytoseiidae, Bdellidae, Cunaxidae, Stigmaeidae, Pymotidae, Cheyletidae, Acaridae, Pyroglyphidae, Orthogalumnidae, Argasidae, Ixodidae, Sarcoptidae. Soil mites in India.
49	Entomology	Post-Graduate	ADVANCED ACAROLOGY	Management of economical important species of mites in agriculture, veterinary and public health; storage acarology.
50	Entomology	Post-Graduate	ADVANCED ACAROLOGY	Mites as vectors of plant pathogens; mode of action, structure-activity relationships of different groups of acaricides; problem of pesticide resistance in mites, resurgence of mites.
51	Entomology	Post-Graduate	MOLECULAR APPROACHES IN ENTOMOLOGICAL RESEARCH	Introduction to molecular biology; techniques used in molecular biology.
52	Entomology	Post-Graduate	MOLECULAR APPROACHES IN ENTOMOLOGICAL RESEARCH	Insect gene transformation; biotechnology in relation to silkworms and honey bees; introduction of lectin genes for pest suppression; DNA finger printing for taxonomy and phylogeny. Genetic improvement of inebriate tolerance of natural enemies.
53	Entomology	Post-Graduate	MOLECULAR APPROACHES IN ENTOMOLOGICAL RESEARCH	DNA-based diagnostics; insect immune systems in comparison to vertebrates; molecular basis of metamorphosis; Sf transgenic technology and implications; molecular biology of baculoviruses; insecticide resistance. Resistance management strategies in transgenic crops.
54	Entomology	Post-Graduate	ADVANCED INTEGRATED PEST MANAGEMENT	Principles of sampling and surveillance; database management and computer programming, simulation techniques and system analysis and modeling.

55	Entomology	Post-Graduate	ADVANCED INTEGRATED PEST MANAGEMENT	Case histories of national and international programmes, their implementation, adoption and criticisms, global trade and risk of invasive pests.
56	Entomology	Post-Graduate	ADVANCED INTEGRATED PEST MANAGEMENT	Genetic engineering and new technologies- their progress and limitations in IPM programmes, deployment of benevolent alien genes for pest management- case studies
57	Entomology	Post-Graduate	INSECT BEHAVIOUR	Foraging- Role of different signals in host searching (plant and insects) and host acceptance, ovipositional behaviour, pollination behaviour, coevolution of plants and insect pollinators. Behaviour in IPM- Concept of super-normal stimuli and behavioural manipulation as potential tool in pest management, use of semio-chemicals, auditory stimuli and visual signals in pest management.
58	Entomology	Post-Graduate	RECENT TRENDS IN BIOLOGICAL CONTROL	Scope of classical biological control and augmentative biocontrol; introduction and handling of natural enemies; nutrition of entomophagous insects and their hosts, dynamics of biocontrol agents vis-à-vis target pest populations.
59	Entomology	Post-Graduate	RECENT TRENDS IN BIOLOGICAL CONTROL	Mass culturing techniques, insectary facilities and equipments, basic standards of insectary, viable mass-production unit, designs, precautions, good insectary practices.
60	Entomology	Post-Graduate	RECENT TRENDS IN BIOLOGICAL CONTROL	Scope of genetically engineered microbes and parasitoids in biological control, genetics of ideal traits in biocontrol agents for introgressing and for progeny selections, breeding techniques of biocontrol agents.
61	Entomology	Post-Graduate	Computing Skills	Fundamentals of Computer
62	Entomology	Post-Graduate	Computing Skills	Communicating using the internet
63	Entomology	Post-Graduate	Computing Skills	Online Security and Privacy
64	Entomology	Post-Graduate	Computing Skills	Programming Basics
65	Entomology	Post-Graduate	General / Scientific Knowledge	Human Body

66	Entomology	Post-Graduate	General / Scientific Knowledge	Basics Chemistry
67	Entomology	Post-Graduate	General / Scientific Knowledge	Basics physics
68	Entomology	Post-Graduate	General / Scientific Knowledge	Basic biology
69	Entomology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Psychological processes and disorders.
70	Entomology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Neurophysiology
71	Entomology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Cellular and systems physiology.
72	Entomology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Genetics and developmental biology
73	Entomology	Post-Graduate	Common Senses	Last figure to complete the series
74	Entomology	Post-Graduate	Common Senses	Analogy/Series completion/Blood Relations
75	Entomology	Post-Graduate	Analyticial Skills	Seating arrangment/Basic numerical operations/ Odd man out
76	Entomology	Post-Graduate	Analyticial Skills	Coded operations of numbers
77	Entomology	Post-Graduate	Statistics	Measures of Central Tendency (Mean Median Mode etc)
78	Entomology	Post-Graduate	Statistics	Weighted Arithmetic Mean
79	Entomology	Post-Graduate	General Awareness	Indian History/Geography
80	Entomology	Post-Graduate	General Awareness	Indian festivals/sports

SUBJECT SPECIALIZATION: VIROLOGY

Sr No	Subject	Level	Topic	Sub Topics
1	Virology	Post-Graduate	GENERAL VIROLOGY	History: Discovery of viruses and development of Virology (contributions of pioneers). Nature, origin and evolution of viruses.
2	Virology	Post-Graduate	GENERAL VIROLOGY	Properties of viruses: Physical- morphology and structure, sedimentation, electrophoretic mobility, buoyant density. Biochemical- chemical composition, nucleic acids, proteins, enzymes, lipids, carbohydrates, polyamines, cat ions. Antigenic nature of viruses. Biological-host range, transmission (vector and non-vector), virus stability.
3	Virology	Post-Graduate	GENERAL VIROLOGY	Nomenclature and classification of viruses: Criteria used for naming and classification. Current ICTV classification of viruses of bacteria, plants and animals and humans.
4	Virology	Post-Graduate	GENERAL VIROLOGY	Isolation, cultivation, assay and maintenance of bacterial, plant and animal viruses: Experimental plants and tissue cultures. Experimental animals, embryonated eggs, organ cultures, primary and secondary cell cultures, suspension and monolayer cell cultures, cell strains, cell lines.
5	Virology	Post-Graduate	GENERAL VIROLOGY	Purification of viruses: Need for virus purification. Extraction of viruses from tissues, clarification, concentration of viruses in clarified extracts by physical and chemical methods, further purification of viruses by rate zonal / equilibrium density gradient centrifugation.Criteria of virus purity.Quantitation and preservation of purified virus preparations.
6	Virology	Post-Graduate	GENERAL VIROLOGY	Quantitation of viruses: Infectivity assay methods (plaque, pock, end point, local / systemic assay of plant viruses), physical (EM), serological (HA, HI, immunofluorescence, ELISA) and chemical (viral protein and nucleic acid based) approaches.
7	Virology	Post-Graduate	GENERAL VIROLOGY	Major characteristics of the following virus families / genera / groups: Adenoviridae, Bromoviridae, Bunyaviridae, Caulimoviridae, Flaviviridae, Geminiviridae, Hepadnaviridae, Herpesviridae, Orthomyxoviridae, Paramyxoviridae, Parvoviridae, Picornaviridae, Potyviridae, Poxviridae, Reoviridae, Retroviridae, Rhabdoviridae, Tobamovirus,
8	Virology	Post-Graduate	GENERAL VIROLOGY	Insect Viruses: Biology of major RNA and DNA viruses of insects and their applications
9	Virology	Post-Graduate	GENERAL VIROLOGY	Importance of viruses in human welfare with suitable examples.
10	Virology	Post-Graduate	GENERAL VIROLOGY	Bacteriophages: Biology of major RNA (MS2, Qβ, Ø6) and DNA (T-even and T-odd, lambda, Mu, Øx174, M13) bacteriophages. Biology of Cyanophages.

				Algal and fungal viruses: Biology of viruses of Phycodnaviridae, Partitiviridaeand Totiviridae. Biology of sub-viral agents:Satellite viruses, sat-RNAs, viroids virusoids and prions. Concept of molecular parasitism.
11	Virology	Post-Graduate	PLANT VIROLOGY	Virus-host interactions: Effects of virus infection on host metabolism; molecular mechanisms of plant viral pathogenesis - role of viral genes in disease induction, host proteins induced by virus infection, processes involved in disease induction. Cytological and histological changes in infected plants.Macroscopic external symptoms (local and systemic). Induction of disease- kinds of host response to virus inoculation, factors influencing the course of infection and disease development.
12	Virology	Post-Graduate	PLANT VIROLOGY	Movement/transport of viruses: Cell to cell and long-distance movement. Distribution of the viruses in the plants.
13	Virology	Post-Graduate	PLANT VIROLOGY	Transmission of viruses:non-vector – sap / mechanical, seed and pollen, graft, dodder, contact. Vector- arthropods (aphids, leaf and plant hoppers, whiteflies, beetles, thrips, mealy bugs), mites, fungi, nematodes.Virus-vector relationships, Molecular mechanisms of virus-vector interactions.Effects of viruses on vectors.Agroinfection.
14	Virology	Post-Graduate	PLANT VIROLOGY	Characterization and identification of viruses and virus strains: Biological, physical, molecular and immunological approaches.
15	Virology	Post-Graduate	PLANT VIROLOGY	Virus ecology and epidemiology of diseases: Epidemiological concepts. Biological and physical factors influencing survival and spread of viruses and diseases. Cropping practices and virus spread. Disease gradients, disease progress curves, mono- and polycyclic diseases. Monitoring of insect vectors.Forecasting of diseases.
16	Virology	Post-Graduate	PLANT VIROLOGY	Assessment of disease incidence and yield losses: Field surveys for determination of incidence of diseases. Approaches for assessment of yield losses.Impact of viruses on crop yields.
17	Virology	Post-Graduate	PLANT VIROLOGY	Management of virus diseases: Direct and indirect approaches- antiviral agents, crop cultural practices, elimination / avoidance of sources of infection, use of virus-free seeds and planting materials, production of virus-free plants by tissue culture technology, avoidance/control of vectors (chemical and non-chemical approaches).
18	Virology	Post-Graduate	PLANT VIROLOGY	Management of virus diseases: Cross- protection/ immunization.Suppression of disease symptoms by chemicals / botanicals. Control through breeding for disease tolerance / resistance. Production of resistant plants by non-conventional approaches- somatic hybridization, transgenic plants exploiting viral and non-viral genes. Plant quarantine and its role in disease control.
19	Virology	Post-Graduate	PLANT VIROLOGY	Detection of Viruses by different approaches: Biological, serological, and molecular assays/tests

20	Virology	Post-Graduate	PLANT VIRUSES AND DISEASES	Cereals and millets: Rice - tungro, dwarf, ragged stunt, grassy stunt, stripe, and yellow mottle. Wheat- soil-borne wheat mosaic, streak mosaic, yellow mosaic / spindle streak mosaic and mosaic caused by BYDV. Barley and Oat – yellow dwarf, stripe mosaic and yellow mosaic.Maize andSorghum – sugarcane mosaic, maize streak , dwarf mosaic, mosaic and stripe viruses caused diseases.
21	Virology	Post-Graduate	PLANT VIRUSES AND DISEASES	Oil seeds crops :Groundnut – bud necrosis, stem necrosis, mottle, stripe, rosette and clump. Sunflower – necrosis and mosaic. Sesamum – leaf curl. Rape seed and mustard – mosaic.Coconut – cadang - cadangviriod disease.
22	Virology	Post-Graduate	PLANT VIRUSES AND DISEASES	Fruit crops : Banana / Plantain - bunchy top, streak, infectious chlorosis and bract mosaic. Citrus - tristera, yellow mosaic, psorosis and exocortis. Papaya- ring spot, leaf curl and mosaic.Grapevine - fern leaf and leaf roll.Apple - mosaic.Pineapple - wilt.
23	Virology	Post-Graduate	PLANT VIRUSES AND DISEASES	Cash crops: Sugarcane- mosaic, Fiji disease, bacilliform virus. Sugarbeet -curly top yellows, western yellows, beet mosaic, BNYV. Cotton - leaf curl diseases, Kenaf- yellow vein mosaic. Tobacco - mosaic and leaf curl.
24	Virology	Post-Graduate	PLANT VIRUSES AND DISEASES	Spice and beverage crops: Smallcardamom – mosaic. Large cardamom - foorkey and chirke diseases.Black Pepper - stunt and yellow mottle. Zinger – chlorotic fleck. Vanilla-mosaic.Cocoa - swollen shoot.
25	Virology	Post-Graduate	PLANT VIRUSES AND DISEASES	Flowering and foliage ornamentals:Tulips– Flower breaking. Rose – mosaic.Gladiolus– BYMV. Orchids – cymbidium mosaic and odontoglassum ring spot viruses. Carnations - mottle, ring spot and etched ringspot. Chrysanthimum –aspermy, ring mottle and stunt viriod. Aroids – DSMV and Konjac mosaic viruses.
26	Virology	Post-Graduate	PLANT VIRUSES AND DISEASES	Tuber crops:Potato- leaf roll, rugose mosaic, mild mosaic / latent caused PVX, PVM and PVS and spindle tuber viriod diseases.Sweet potato – mild and feathery mottle.Cassava – common, African and Indian mosaic diseases. Colocasia and Cocoyam – Feathery mottle, Babone and Alomae diseases.Greater yam – mosaic.
27	Virology	Post-Graduate	MOLECULAR VIROLOGY	Molecular architecture of viruses: Principles of virus structure- Icosahedral and helical tubes (TMV), cubic symmetry, in vitro reconstitution experiments, structured-based categories of viral designs and their characteristics-simple icosahedral symmetric capsids with Jelly-Roll Beta barrel sub-units (Polio, TBSV, SBMV, SeMV), ds DNA (Pox virus, Baculovirus, HSV, Adeno) dsRNA viruses (Reovirus), enveloped positive-stranded RNA viruses, enveloped viruses with trimeric, alpha helical, coiled-coil fusion proteins. Viruses with head-tail morphology- (T4). Occurrence of different morphologies, principles of disassembly- particles are metastable.
28	Virology	Post-Graduate	MOLECULAR VIROLOGY	Molecular mode of inactivating agents on viruses: physical agents – ionizing radiation; non-ionizing radiation, temperature (heat); ultrasonic vibration. Chemical agents – inorganic; organic solvents; ions; chelating agents; hydroxylamine; dyes.

29	Virology	Post-Graduate	MOLECULAR VIROLOGY	Viral genomes: Structure and complexity of viral genomes, diversity among viral genomes- DNA genomes- linear and circular double and single stranded. RNA genomes- Positive and Negative, linear, circular, double and single stranded, mono, bi, tri and multipartite genomes.
30	Virology	Post-Graduate	MOLECULAR VIROLOGY	Replication of viruses: Investigation of virus replication, an overview of virus replication cycles , replication strategies, host cell functions required in virus replication, sites of replication and assembly, importance of mutants in assembly studies.
31	Virology	Post-Graduate	MOLECULAR VIROLOGY	Replication strategies of DNA viruses: Baltimore strategies on viral genome expression, Replication of DNA viruses, transcription of viral DNA, preparing the cell for viral DNA replication, universal mechanism of viral DNA replication, strategies to ensure complete replication, genome resolution, packaging, replication of circular dsDNA - Papoviruses, replication of linear dsDNA that conform circles- Herpes, Lambda; replication of linear dsDNA genomes- Adeno, Pox ,
32	Virology	Post-Graduate	MOLECULAR VIROLOGY	Replication strategies of DNA viruses: replication of ss circular DNA- phi x 174, replication of linear ssDNA - parvo, dependence versus autonomy among DNA viruses. Gene expression and its regulation in DNA viruses- Polyoma, Adeno, Pox, Parvo, Retro, Hepadna, DNA phages, papilloma and Herpes viruses.
33	Virology	Post-Graduate	MOLECULAR VIROLOGY	Expression and replication of RNA Viruses:Structure and organization of viral RNA genomes, regulatory elements for RNA virus genome synthesis, synthesis of the RNA genomes. Viruses with positive sense ssRNAs - MS2/ Q b, Picorna- Toga-, Tobamo-, Poty-, Nepo- and Bromo-viruses. Negative and Ambisense ss RNA viruses- Ortho-, Paramyxo, Bunya and Rhabdo- viruses. dsRNA viruses- Reo- and Birna- virues. ssRNA viruses with DNA intermediate - RSV and HIV. dsDNA viruses with RNA intermidate- CaMV, Hepatitis B.
34	Virology	Post-Graduate	MOLECULAR VIROLOGY	Regulation of viral genome expression: MS2, T4, Lambda phage, Corona virus, HIV, Adenovirus and Herpesvirus. Functions of virus encoded products. Assembly of viruses- self-assembly from mature virion components, assembly of virus with helical structure (TMV), isometric structure (Adeno, Picorna) and with complex structure (T4).Assembly of enveloped viruses (Herpes, Filo, Retroviruses).Maturation of virus particles.
35	Virology	Post-Graduate	MOLECULAR VIROLOGY	Tumor Virology: Terminology. Viruses associated with tumors. Molecular mechanisms of tissue transformation and tumorogenesis by viruses.
36	Virology	Post-Graduate	MOLECULAR VIROLOGY	Replication of sub-viral agents:Viroids, Hepatitis D, Sat-viruses, Sat-RNAs, DI particles, Prions.
37	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	Virus-host interactions: Influence of virus on host organism- latent infection, cytopathic effects of viral infections, inclusion bodies, chromosomal aberrations; Response of host cells to viral infection- Host specificity, resistance, interference, immunological responses of the host, host induced modification, patterns of host response-biological

				gradient, systemic and general syndromes-interactions.
38	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	Virus offense meets host defense: Host defense against viral infections, innate and adaptive immune response to viruses. Molecular mechanisms of viral pathogenesis with respect to poliovirus, rotavirus, herpesvirus (CMV).
39	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	n of viruses: Vertical (Direct) transmission- contact, transplacental, transovarial, sexual, fecal-oral, respiratory; Horizontal (Indirect) transmission- aerosols, fomites, water, food; Vector-arthropod, non-arthropods; Multiple host infections- viral zoonosis. Persistence of viruses:Pattern of viral infection, mechanism of viral persistence.
40	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	Mechanism of infection and viral spread in the body: Routes of entry- skin, respiratory tract, oropharynex and intestinal tract, conjunctiva, genital; Host specificity and tissue tropism- receptors, viral enchancers; Mechanism of virus spread in the body- spread in epithelia, subepithelial invasion and lymphatic spread, spread by the blood stream, invasion of the skin, central nervous system, respiratory and intestinal tracts, other organs.
41	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	Epidemiological concepts and methods of virus diseases: Scope of epidemiology- epidemiological investigation of virus diseases, qualitative and quantitative investigations. Definition of terms, types of epidemiological investigations, components of epidemiology, biological and physical factors influencing the survival and spread of virus diseases.
42	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	Describing disease occurrence: Measures of disease occurrence, prevalence, incidence, mapping.
43	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	Disease determinants: Host, agent and environment determinants, interactions.
44	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	Factors affecting virus ecology and epidemiology: Physical stability and concentration of virus, socio-economic factors, host characteristics- age, sex, morphological and physiological conditions, wild and domestic animals as sources of virus; Physical factors-rainfall, water, wind, air, temperature, soil, seasonal variations.
45	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	Virus disease surveillance: Types of surveillance, elements and other surveillance methods, evaluation and application of virus surveillance; Quarantine of viral diseases-International and national.
46	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	Strategies of virus maintenance in communities: Wild and domestic animals, rural and urban populations.

47	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	Surveys: Basic concepts, types of sampling, surveys, collecting information, monitoring vectors, pattern of disease progress.
48	Virology	Post-Graduate	ANIMAL AND HUMAN VIROLOGY	Prevention and Control of viruses: The infection control policy- aseptic techniques, cleaning and disinfection, protective clothing, isolation; Prevention- sanitation, vector control, vaccines and immunization; Control-chemoprophylaxis, chemotherapy (antiviral drugs, Interferon therapy), efficacy of infection control.
49	Virology	Post-Graduate	APPLIED VIROLOGY	Diagnostic virology: Collection, transport and processing of samples. Biological, Physical, Chemical, immunological and molecular approaches for identification and diagnosis of plant and animal and human viruses.
50	Virology	Post-Graduate	APPLIED VIROLOGY	Vaccines to viruses: Type of immunization procedures, active and passive immunization, designing of vaccines, classical and novel/modern approaches for the production of vaccines, purified macromolecules as vaccines, Recombinant – vector vaccines, DNA vaccines, Synthetic peptide vaccines, Multivalent sub-unit vaccines, uses of vaccines, benefits of vaccination, mass immunization programs.
51	Virology	Post-Graduate	APPLIED VIROLOGY	Virus-free plants: Production and mass multiplication of virus-free field and horticultural crops and ornamental plants by tissue culture technologies.
52	Virology	Post-Graduate	APPLIED VIROLOGY	Virus resistant / tolerant crops: Production of virus resistant / tolerance crops through transgenic technology by exploiting genes derived from viruses, natural resistant plants and from other sources. Guidelines for testing and field release of transgenic crops in India.
53	Virology	Post-Graduate	APPLIED VIROLOGY	Viruses as molecular model systems in Biology and Molecular Biology: Viral nucleic acids as genetic materials. Exploitation of viruses as model systems in the development of new technologies in biology.
54	Virology	Post-Graduate	APPLIED VIROLOGY	Viruses as unique genetic resources: Exploitation of viral genes / sequences in the construction of varied types of gene vectors (cloning, shuttle, expression and transcription) and their applications. Virus genes as a source of navel enzymes, gene expression activators and silencers.Molecular model systems in understanding the replication of nucleic acids and regulation of gene expression strategies and cancer biology (SV-40, adeno and papillomaviruses).Display of foreign peptides on virion surface and applications.
55	Virology	Post-Graduate	APPLIED VIROLOGY	Viruses as biological warfare, biocrime and bioterrorism agents: Small poxvirus (variola), viral encephalitis and viral hemorrhagic fevers; HIV, viral hemorrhagic fevers (Ebola) and yellow fever virus.
56	Virology	Post-Graduate	CLINICAL VIRIOLOGY	Introduction to Virology; Characteristics and Replication of Viruses, Different methods to study viruses, virus isolation, serology techniques, molecular techniques
57	Virology	Post-Graduate	CLINICAL VIRIOLOGY	Viral Specimen collection and processing, diagnosis of Viral Infections; laboratory biosafety and quality control.

58	Virology	Post-Graduate	CLINICAL VIRIOLOGY	Epidemiology principles, describing disease occurrence, disease surveillance and control strategies, modern vaccinology.
59	Virology	Post-Graduate	CLINICAL VIRIOLOGY	Poliomyelitis and other enterovirus infections; Herpesviruses; poxviruses, lyssavirus and rabies, Arthropod-borne viruses, Rubella-postnatal infections;
60	Virology	Post-Graduate	CLINICAL VIRIOLOGY	filoviruses and Arenaviruses, rotaviruses; Hepatitis viruses, Papovaviruses; Retroviruses and AIDS; Unconventional slow viruses, prions.
61	Virology	Post-Graduate	Computing Skills	Fundamentals of Computer
62	Virology	Post-Graduate	Computing Skills	Communicating using the internet
63	Virology	Post-Graduate	Computing Skills	Online Security and Privacy
64	Virology	Post-Graduate	Computing Skills	Programming Basics
65	Virology	Post-Graduate	General / Scientific Knowledge	Human Body
66	Virology	Post-Graduate	General / Scientific Knowledge	Basics Chemistry
67	Virology	Post-Graduate	General / Scientific Knowledge	Basics physics
68	Virology	Post-Graduate	General / Scientific Knowledge	Basic biology
69	Virology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Psychological processes and disorders.
70	Virology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Neurophysiology

71	Virology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Cellular and systems physiology.
72	Virology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Genetics and developmental biology
73	Virology	Post-Graduate	Common Senses	Last figure to complete the series
74	Virology	Post-Graduate	Common Senses	Analogy/Series completion/Blood Relations
75	Virology	Post-Graduate	Analyticial Skills	Seating arrangment/Basic numerical operations/ Odd man out
76	Virology	Post-Graduate	Analyticial Skills	Coded operations of numbers
77	Virology	Post-Graduate	Statistics	Measures of Central Tendency (Mean Median Mode etc)
78	Virology	Post-Graduate	Statistics	Weighted Arithmetic Mean
79	Virology	Post-Graduate	General Awareness	Indian History/Geography
80	Virology	Post-Graduate	General Awareness	Indian festivals/sports

SUBJECT SPECIALIZATION: PHARMACOLOGY

Sr No	Subject	Level	Topic	Sub Topics
1	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY- I	General Pharmacology: a. Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Concepts of linear and non-linear compartment models. Significance of Protein binding.
2	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY- I	General Pharmacology b. Pharmacodynamics: Mechanism of drug action and the relationship between drug concentration and effect. Receptors, structural and functional families of receptors quantitation of drug receptors interaction and elicited effects.
3	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY- I	Neurotransmission a. General aspects and steps involved in neurotransmission. b. Neurohumoral transmission in autonomic nervous system (Detailed study about neurotransmitters- Adrenaline and Acetylcholine). c. Neurohumoral transmission in central nervous system (Detailed study about neurotransmitters-histamine, serotonin, dopamine, GABA, glutamate and glycine]. d. Non-adrenergic non-cholinergic transmission (NANC). Cotransmission
4	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY- I	Systemic Pharmacology A detailed study on pathophysiology of diseases, mechanism of action, pharmacology and toxicology of existing as well as novel drugs used in the following systems Autonomic Pharmacology Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting neuromuscular junction
5	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY- I	Central nervous system Pharmacology General and local anesthetics Sedatives and hypnotics, drugs used to treat anxiety. Depression, psychosis, mania, epilepsy, neurodegenerative diseases. Narcotic and non-narcotic analgesics.

6	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY- I	Cardiovascular Pharmacology Diuretics, antihypertensives, antiischemics, anti- arrhythmics, drugs for heart failure and hyperlipidemia. Hematinics, coagulants, anticoagulants, fibrinolytics and antiplatelet drugs.
7	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY- I	Autacoid Pharmacology The physiological and pathological role of Histamine, Serotonin, Kinins Prostaglandins Opioid autacoids. Pharmacology of antihistamines, 5HT antagonists.
8	Pharmacology	Post-Graduate	CLINICAL PHARMACOLOGY AND PHARMACOTHERAPEUTICS	Principles of Pharacokinetics: 1. Revision of basic concepts. 2. Clinical Pharmacokinetics. a. Dose – response in man b. Influence of renal and hepatic disease on Pharmacokinetics c. Therapeutics drug monitoring & individualization of drug therapy d. Population Pharmacokinetics.
9	Pharmacology	Post-Graduate	CLINICAL PHARMACOLOGY AND PHARMACOTHERAPEUTICS	Adverse Drug Reactions, Drug Interactions, ADR monitoring & Pharmacovigilance.
10	Pharmacology	Post-Graduate	CLINICAL PHARMACOLOGY AND PHARMACOTHERAPEUTICS	Pathophysiology and drug therapy of the following disorders. Schizophrenia, anxiety, depression, epilepsy, Parkinson's, alzheimer's diseases, hypertension, angina pectoris, arrhythmias, atherosclerosis, myocardial infaraction.
11	Pharmacology	Post-Graduate	CLINICAL PHARMACOLOGY AND PHARMACOTHERAPEUTICS	Pathophysiology and drug therapy of the following disorders. TB, leprosy, leukemia, solid tumors, lymphomas, psoriasis, respiratory, urinary, g.i. tract infections, endocarditis, fungal and HIV infection, rheumatoid arthritis, glaucoma, menstrual disorders, menopause.
12	Pharmacology	Post-Graduate	CLINICAL PHARMACOLOGY AND PHARMACOTHERAPEUTICS	Drug therapy in a) Geriatrics b) Pediatrics c) Pregnancy & Lactation. d) Renal & hepatic insufficiency
13	Pharmacology	Post-Graduate	PHARMACOKIENTICS AND DRUG METABOLISM	Drug Absorption: Gastrointestinal, percutaneous, and rectal kinetics and factors affecting drug absorption. Absorption kinetics

14	Pharmacology	Post-Graduate	PHARMACOKIENTICS AND DRUG METABOLISM	Drug Distribution: Plasma protein binding – factors affecting plasma protein binding – Tissue binding – transfer of drugs through biological barriers their therapeutic implication in drug action. Volume of distribution. Reaction of the body to foreign substances: Biotransformation of drugs, phase I and phase II metabolic reactions. Hepatic Clearance
15	Pharmacology	Post-Graduate	PHARMACOKIENTICS AND DRUG METABOLISM	Elimination of drugs: Concept of renal clearance and excretion of drugs – biological half – life, area under curve.
16	Pharmacology	Post-Graduate	PHARMACOKIENTICS AND DRUG METABOLISM	Bioavailability of drug products: Bioavailability tests. Bioequivalence. Compartment models and relevant pharmacokinetic parameters.
17	Pharmacology	Post-Graduate	PHARMACOKIENTICS AND DRUG METABOLISM	Pharmacogenetics: Inter racial and individual variability in drug metabolism.
18	Pharmacology	Post-Graduate	CLINICAL RESEARCH AND PHARMACOVIGILANCE	Regulatory Perspectives of Clinical Trials: Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant-Schedule Y, ICMR, Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process
19	Pharmacology	Post-Graduate	CLINICAL RESEARCH AND PHARMACOVIGILANCE	Clinical Trial Documentation: Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring-Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. predictability and preventability assessment. Management of adverse drug reactions; Terminologies of ADR.
20	Pharmacology	Post-Graduate	CLINICAL RESEARCH AND PHARMACOVIGILANCE	Basic aspects, terminologies and establishment of pharmacovigilance: History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring programme, WHO and Regulatory terminologies of ADR, evaluation of medication safety, establishing pharmacovigilance centres in Hospitals, Industry and National programmes related to pharmacovigilance.

				Roles and responsibilities in Pharmacovigilance.
21	Pharmacology	Post-Graduate	CLINICAL RESEARCH AND PHARMACOVIGILANCE	Methods, ADR reporting and tools used in pharmacovigilance: International classification of diseases, International Nonproprietary names for drugs, Passive and Active surveillance, Comparative observational studies, targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, Vigi Flow, Statistical methods for evaluating medication safety data.
22	Pharmacology	Post-Graduate	PRINCIPLES OF DRUG DISCOVERY	An overview of modern drug discovery process: Target identification, target validation, lead identification, and lead Optimization. Economics of drug discovery. Target Discovery and validation-Role of Genomics, Proteomics and Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins. Role of transgenic animals in target validation.
23	Pharmacology	Post-Graduate	PRINCIPLES OF DRUG DISCOVERY	Lead Identification: combinatorial chemistry & high throughput screening, in silico lead discovery techniques; Assay development for hit identification. Protein structure Levels of protein structure, Domains, motifs, and folds in protein structure. Computational prediction of protein structure: Threading and homology modeling methods. Application of NMR and X-ray crystallography in protein structure prediction.
24	Pharmacology	Post-Graduate	PRINCIPLES OF DRUG DISCOVERY	Rational Drug Design: Traditional vs rational drug design, Methods followed in traditional drug design, High throughput screening, Concepts of Rational Drug Design, Rational Drug Design Methods: Structure and Pharmacophore based approaches. Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,
25	Pharmacology	Post-Graduate	PRINCIPLES OF DRUG DISCOVERY	Molecular docking: Rigid docking, flexible docking, manual docking; Docking based screening. De novo drug design. Quantitative analysis of Structure Activity Relationship History and development of QSAR, SAR versus QSAR, Physicochemical parameters, Hansch analysis, Fee Wilson analysis, and relationship between them.

26	Pharmacology	Post-Graduate	PRINCIPLES OF DRUG DISCOVERY	QSAR Statistical methods: regression analysis, partial least square analysis (PLS) and other multivariate statistical methods. 3D-QSAR approaches like COMFA and COMSIA Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption, and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design.
27	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY – II	Endocrine Pharmacology: Molecular and cellular mechanism of action of hormones such as growth hormone, prolactin, thyroid, insulin and sex hormones Anti-thyroid drugs, Oral hypoglycemic agents, Oral contraceptives, Corticosteroids. Drugs affecting calcium regulation.
28	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY – II	Chemotherapy I Cellular and molecular mechanism of actions and resistance of antimicrobial agents such as ß-lactams, aminoglycosides, quinolones, Macrolide antibiotics. Antifungal, antiviral, and anti-TB drugs.
29	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY – II	Chemotherapy II: Drugs used in Protozoal Infections Drugs used in the treatment of Helminthiasis Chemotherapy of cancer Immunopharmacology Cellular and biochemical mediators of inflammation and immune response. Allergic or hypersensitivity reactions. Pharmacotherapy of asthma and COPD. Immunosuppressants and Immunostimulants.
30	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY – II	GIT Pharmacology: Antiulcer drugs, Prokinetics, antiemetics, anti-diarrheals and drugs for constipation and irritable bowel syndrome. Chronopharmacology Biological and circadian rhythms, applications of chronotherapy in various diseases like cardiovascular disease, diabetes, asthma, and peptic ulcer
31	Pharmacology	Post-Graduate	ADVANCED PHARMACOLOGY – II	Free radicals Pharmacology: Generation of free radicals, role of free radicals in etiopathology of various diseases such as diabetes, neurodegenerative diseases and cancer. Protective activity of certain important antioxidant Recent Advances in Treatment: Alzheimer's disease, Parkinson's disease, Cancer, Diabetes mellitus
32	Pharmacology	Post-Graduate	PHARMACOLOGICAL SCREENING METHODS AND TOXICOLOGY	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. General principles of preclinical screening. CNS Pharmacology: behavioral and muscle co ordination, CNS stimulants and depressants, anxiolytics, anti-psychotics,

				anti epileptics and nootropics. Drugs for neurodegenerative diseases like Parkinsonism, Alzheimers and multiple sclerosis. Drugs acting on Autonomic Nervous System.
33	Pharmacology	Post-Graduate	PHARMACOLOGICAL SCREENING METHODS AND TOXICOLOGY	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. Respiratory Pharmacology: anti-asthmatics, drugs for COPD and anti allergics. Reproductive Pharmacology: Aphrodisiacs and antifertility agents Analgesics, anti-inflammatory and antipyretic agents. Gastrointestinal drugs: anti ulcer, anti -emetic, antidiarrheal and laxatives.
34	Pharmacology	Post-Graduate	PHARMACOLOGICAL SCREENING METHODS AND TOXICOLOGY	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. Cardiovascular Pharmacology: antihypertensives, antiarrhythmics, antianginal, antiatherosclerotic agents and diuretics. Drugs for metabolic disorders like anti-diabetic, antidyslipidemic agents. Anti cancer agents. Hepatoprotective screening methods.
35	Pharmacology	Post-Graduate	PHARMACOLOGICAL SCREENING METHODS AND TOXICOLOGY	Toxicology: Principles of Toxicology, Mutagenesis and Carcinogenesis. Teratogenecity & its mechanisms, Councelling of women about teratogenic risks. Acute and Subacute, Chronic toxicity studies
36	Pharmacology	Post-Graduate	QUALITY USE OF MEDICINES	Introduction to Quality use of medicines (QUM): Definition and Principles of QUM, Key partners and responsibilities of the partners, Building blocks in QMC, Evaluation process in QMC, Communication in QUM, Cost effective prescribing.
37	Pharmacology	Post-Graduate	QUALITY USE OF MEDICINES	QUM in various settings: Hospital settings, Ambulatory care/Residential care, Role of health care professionals in promoting the QUM, Strategies to promote the QUM, Impact of QUM on E-health, integrative medicine and multidisciplinary care. QUM in special population: Pediatric prescribing, Geriatric prescribing, prescribing in pregnancy and lactation,

				Prescribing in immune compromised and organ failure patients.
38	Pharmacology	Post-Graduate	QUALITY USE OF MEDICINES	Concepts in QUM Evidence based medicine: Definition, concept of evidence-based medicine, Approach and practice of evidence-based medicine in clinical settings Essential drugs: Definition, need, concept of essential drug, National essential drug policy and list Rational drug use: Definition, concept and need for rational drug use, Rational drug prescribing, Role of pharmacist in rational drug use.
39	Pharmacology	Post-Graduate	QUALITY USE OF MEDICINES	Regulatory aspects of QUM in India: Regulation including scheduling, Regulation of complementary medicines, Regulation of OTC medicines, Professional responsibility of pharmacist, Role of industry in QUM in medicine development.
40	Pharmacology	Post-Graduate	QUALITY USE OF MEDICINES	Medication errors: Definition, categorization and causes of medication errors, Detection and prevention of medication errors, Role of pharmacist in monitoring and management of medication errors Pharmacovigilance: Definition, aims and need for pharmacovigilance, Types, predisposing factors and mechanism of adverse drug reactions (ADRs), Detection, reporting and monitoring of ADRs, Causality assessment of ADRs, Management of ADRs, Role of pharmacist in pharmacovigilance.
41	Pharmacology	Post-Graduate	PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS	Introduction to Pharmacoepidemiology: Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio
42	Pharmacology	Post-Graduate	PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS	Pharmacoepidemiological Methods: Qualitative models: Drug Utilization Review; Quantitative models: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta analysis models, Drug effects study in

				populations: Spontaneous reporting, Prescription event monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology
43	Pharmacology	Post-Graduate	PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS	Introduction to Pharmacoeconomics: Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs. Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost-effective Ratio, Average Cost-Effective Ratio. Person Time, Willingness To Pay, Time Trade Off and Discounting.
44	Pharmacology	Post-Graduate	PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS	Pharmacoeconomic evaluations: Definition, Steps involved, Applications, Advantages and disadvantages of the following Pharmacoeconomic models: Cost Minimization Analysis (CMA), Cost Benefit Analysis (CBA), Cost Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA).
45	Pharmacology	Post-Graduate	PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS	Definition, Steps involved, Applications, Advantages and disadvantages of the following: Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures. Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in Pharmacoeconomic analysis, Applications of Pharmacoeconomics.
46	Pharmacology	Post-Graduate	ADVANCED DRUG DELIVERY SYSTEMS	Fundamentals of controlled drug delivery systems, pharmacokinetic and pharmacodynamic basis of controlled drug delivery. Design, fabrication, evaluation and applications of the following controlled releasing systems a. Controlled release oral drug delivery systems b. Parenteral controlled release drug delivery systems
47	Pharmacology	Post-Graduate	ADVANCED DRUG DELIVERY SYSTEMS	Biochemical and molecular biology approaches to controlled drug delivery of a. Bioadhesive drug delivery systems b. Nasal drug delivery systems c. Drug delivery to Colon

48	Pharmacology	Post-Graduate	ADVANCED DRUG DELIVERY SYSTEMS	Biochemical and molecular biology approaches to control drug delivery of a. Liposomes b. Niosomes c. Microspheres d. Nanoparticles e. Resealed erythrocytes
49	Pharmacology	Post-Graduate	ADVANCED DRUG DELIVERY SYSTEMS	Drug targeting to particular organs a. Delivery to lungs b. Delivery to the brain and problems involved c. Drug targeting in neoplasams
50	Pharmacology	Post-Graduate	PHARMACEUTICAL MANAGEMENT	Pharmaceutical Management: Meaning, Evolution-scientific, administrative and human relation approach. Process of management: Planning, organizing, staffing, directing, coordinating and controlling– a preliminary idea of concepts, processes and techniques.
51	Pharmacology	Post-Graduate	PHARMACEUTICAL MANAGEMENT	Fundamental concepts of production, financial, personal, legal and marketing functions with special reference to Pharmaceutical Management. Introduction to budgeting, costing, accounting, auditing, and budgetary control. Entrepreneurship development.
52	Pharmacology	Post-Graduate	PHARMACEUTICAL MANAGEMENT	Understanding organizations: Meaning, process, types of organization structures and departmentation, line/staff authority, promoting organizational culture. Organizations, pharmaceutical services and functioning of hospital pharmacy, bulk drug unit, formulation unit, Ayurvedic and Unani manufacturing units and testing labs etc.
53	Pharmacology	Post-Graduate	PHARMACEUTICAL MANAGEMENT	Professional Mangers; Tasks, responsibilities and skills needed. Leadership; Styles and managing change. Decision Making; Types, procedures, evaluation and selection of alternatives, decision making under various situations. Management information and decision support systems and time management.
54	Pharmacology	Post-Graduate	PHARMACEUTICAL MANAGEMENT	Management of Industrial Relations: Industrial disputes, settlement of disputes through various routes such as bargaining, etc. Motivational aspects, theories of motivation, group dynamics, rewards and incentives, interpersonal skills, significance of communication, its

				processes, measures for effective communication, conflict management. Stress management.
55	Pharmacology	Post-Graduate	PHARMACEUTICAL MANAGEMENT	Personnel Management: Job Analysis, recruitment, selection, orientation and training, performance appraisal and compensation. Retrenchment, lay off and discharge.
56	Pharmacology	Post-Graduate	PHARMACOKINETICS AND THERAPEUTIC DRUG MONITORING	Introduction to pharmacokinetics: Compartmental and Non-compartmental models, Renal and non-renal clearance, Organ extraction and models of hepatic clearance, Estimation and determinants of bioavailability, Multiple dosing, Calculation of loading and maintenance doses.
57	Pharmacology	Post-Graduate	PHARMACOKINETICS AND THERAPEUTIC DRUG MONITORING	Therapeutic Drug Monitoring Introduction, Necessity of TDM, Criteria for valid TDM, Essentials for effective TDM, Organization of a TDM service, information requirements for TDM, effectiveness of TDM.
58	Pharmacology	Post-Graduate	PHARMACOKINETICS AND THERAPEUTIC DRUG MONITORING	Drug selection, Dosage regimen design, Pharmacokinetics of the Drug, Patient compliance, Evaluation of pateint's response, Measurement of serum drug concentrations, Monitoring serum drug concentrations, Design of dose regimens. Conversion from i.v. infusion to oral dosing. Determination of dose frequently, dosing of drugs in elderly.
59	Pharmacology	Post-Graduate	PHARMACOKINETICS AND THERAPEUTIC DRUG MONITORING	Analytical aspects of TDM, Uses of HPLC and Immunoassays in TDM
60	Pharmacology	Post-Graduate	PHARMACOKINETICS AND THERAPEUTIC DRUG MONITORING	TDM of selected individual drugs - Aminoglycosides, Carbamazepine, Theophulline Digoxin, Methotrexate, Phenytoin, Aspirin, Lithium, Valproic acid.
61	Pharmacology	Post-Graduate	Computing Skills	Fundamentals of Computer
62	Pharmacology	Post-Graduate	Computing Skills	Communicating using the internet
63	Pharmacology	Post-Graduate	Computing Skills	Online Security and Privacy
64	Pharmacology	Post-Graduate	Computing Skills	Programming Basics

65	Pharmacology	Post-Graduate	General / Scientific Knowledge	Human Body
66	Pharmacology	Post-Graduate	General / Scientific Knowledge	Basics Chemistry
67	Pharmacology	Post-Graduate	General / Scientific Knowledge	Basics physics
68	Pharmacology	Post-Graduate	General / Scientific Knowledge	Basic biology
69	Pharmacology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Psychological processes and disorders.
70	Pharmacology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Neurophysiology
71	Pharmacology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Cellular and systems physiology.
72	Pharmacology	Post-Graduate	Current Affairs : Development in Biomedicial Sciences	Genetics and developmental biology
73	Pharmacology	Post-Graduate	Common Senses	Last figure to complete the series
74	Pharmacology	Post-Graduate	Common Senses	Analogy/Series completion/Blood Relations
75	Pharmacology	Post-Graduate	Analyticial Skills	Seating arrangment/Basic numerical operations/ Odd man out
76	Pharmacology	Post-Graduate	Analyticial Skills	Coded operations of numbers
77	Pharmacology	Post-Graduate	Statistics	Measures of Central Tendency (Mean Median Mode etc)
78	Pharmacology	Post-Graduate	Statistics	Weighted Arithmetic Mean
79	Pharmacology	Post-Graduate	General Awareness	Indian History/Geography
80	Pharmacology	Post-Graduate	General Awareness	Indian festivals/sports