Syllabus for Paper III (core)
Post code : EVT2
Taken from curriculum of first degree program –Biotechnology & Microbiology (Taken from Kerala university -2015 syllabus on biotechnology & biochemistry)

Biotechnology/Microbiology:

Solutions: Meaning of normality, molality, molarity, percentage solution, mole fraction, parts per million, simple numerical problems from the above, fundamental principles of diffusion, osmosis, osmotic pressure, Vant Hoff's laws of osmotic pressure, simple numerical problems, definition of isotonic, hypotonic and hypertonic solutions, biological importance of osmosis, surface tension, viscosity.

Colloids: Definition of true solutions, suspensions, colloids and crystalloids, distinction between lyophilic and lyophobic colloids, properties of colloids, biological significance of colloids, emulsions and emulsifying agents, Donnan membrane equilibrium, Donnan equation and its significance.

Colorimetry and Spectrophotometery: Beer-Lambert's law, molar extinction coefficient, colorimeter, spectrophotometer.

Centrifugation: Principle of sedimentation technique, principle and procedure and application of differential centrifugation, density gradient centrifugation, ultra centrifugation, rate zonal centrifugation, Isopycnic centrifugation pH meter: Principle and working.

Classification of microorganisms: bacteria, virus, fungi, protozoa; concept of microbial species, strains, biovars, serovars. Introduction to Bergey's manual

Microbial cell structure: Eukaryotic and prokaryotic cells, Gram positive and Gram negative bacteria, Structure of a bacteria; Motility in bacteria, kinds of flagella and ultra structure of flagella; Sporulation

Bacterial nutrition: Culture media- types and uses, Bacterial Growth curve, factors affecting growth of microbes; measurement of growth; Batch culture, fed batch culture and continuous culture; Synchronous growth of microbes. Pure culture Methods: Direct plating, Serial dilution technique, Spread plate, streak plate, pour plate; slant culture and stab culture, Culture techniques of anaerobes

Biogeochemical cycles:

Carbon, Nitrogen, Sulphur and Phospherous; Methanogenic bacteria Extremphiles-Thermophiles Acidophiles, Halophiles and alkalophiles; Biotechnological application of extremophiles

Water pollution:

Organic load in aquatic systems - BOD and COD, microbial quality of water, Laboratory methods for the detection of coliforms in drinks and food; fecal and non-fecal bacteria; Treatment of municipal wastes and hazardous industrial effluents.

Non-conventional energy sources:
Biomass: utilization of biomass as energy source– application of microbes in production of fuels from biomass- biogas and methanogenic bacteria, Steps and process of Biogas production; vegetable oils as engine fuels, energy crops-jojoba; Bioplastic

Bioremediation: herbicides and other toxic chemicals in the environment; Biodegradation, phytoremediation, superbug; Biopesticides- *Bacillus thuringiensis*, bioherbicides; Solid waste treatment- Composting, vermicomposting; Disposal of sludge- Land filling, lagooning

Environmental biotechnology, biological wastewater treatment, waste management, Sewage treatment, anaerobic digestion, biogas plant, biogas, bioremediation, constructed wet lands, fermentation, down-stream processing,

Environment Basic concepts:

Ecosystems-Concept of an ecosystem- structure and function of an ecosystem, Definition- genetic, species and ecosystem diversity, Biotic and abiotic components- Energy flow in an ecosystem; Environmental pollution, water, soil and air pollution, pollution control measures, water resources, use and over exploitation of surface water and ground water,

Environment protection Act. Air [prevention and control of pollution] Act. Water [prevention and control of pollution] Act; Wastewater discharge standards, Wastewater treatment and reuse options,

Scope and Importance of Environmental Biotechnology; Pollution- sources of pollution, general characteristics; Environmental legislation-water Act; Forest Act; Environmental Protection act.

Sterilization techniques, Biosafety level, DNA extraction, DNA purification and quantification, PCR, Electrophoresis, Protein purification, Gel documentation system, DNA sequencing, NGS analysis, RT-PCR, DNA fingerprinting,

pH meter, spectrophotometer (UV and Visible) and colorimeter- Beer-Lambert law, Brief account of densitometry, fluorimetry, centrifugation, atomic absorption spectroscopy, IR, NMR and X-ray crystallography and Mass spectrometry

Good Laboratory Practices (GLP), IPR and Patents in Biotechnology, Patent searching, plagiarism.

Environmental sciences:

Climate change. Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust; Sustainable development goals,

Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources

From unsustainable to sustainable development. Urban problems related to energy. Water conservation, Rain water harvesting, water shed management.