

JAYPEE INSTITUTE OF INFORMATION  
TECHNOLOGY

M.Sc. ENVIRONMENTAL  
BIOTECHNOLOGY  
(II SEMESTER)

2023-2024

### Environmental Biotechnology Lab-II

<b>Course Code</b>	20M35BT112	<b>Semester</b> Even	<b>Semester II</b> <b>Session</b> 2023 -24 <b>Month from</b> January to June
<b>Course Name</b>	Environmental Biotechnology Lab-II		
<b>Credits</b>	0-0-4	<b>Contact Hours</b>	8

<b>COURSE OUTCOMES</b> Students will be able to		<b>COGNITIVE LEVELS</b>
<b>CO1</b>	Understand various culture media, their applications and methods of sterilization	Level II (Understand)
<b>CO2</b>	Apply standard microbiological techniques for isolation, culturing and enumeration of microorganisms	Level III (Apply)
<b>CO3</b>	Apply microorganisms as indicators of environmental health	Level III (Apply)
<b>CO4</b>	Apply immunological principles for understanding of microbial diseases	Level III (Apply)
<b>CO5</b>	Examine different types of toxic substances, their toxicological impact and their remediation	Level IV (Analyze)

<b>Module No.</b>	<b>Title of the Module</b>	<b>List of Experiments</b>
1.	<b>Isolation of microorganisms from different sources</b>	Media preparation & sterilization – Bacteria; Media preparation & sterilization – fungi; Preparation of agar plants and slants; Culturing microorganisms on agar media by streaking / stab / point inoculation; Serial dilution of microbial culture; Estimation of microbial growth by colony counting
2.	<b>Environmental Microbiology</b>	Determination of enzyme activities as pollution indicator (e.g. esterase, lipase, dehydrogenases) in contaminated soil and water samples; Total coliform bacteria count in contaminated water samples from different locations; Determination of BOD, COD
3.	<b>Environmental Toxicology</b>	Evaluating of health of agriculture soil (pH, Organic carbon, phosphorous, nitrate-nitrogen); Microbial degradation of selected pollutants; microbe-mediated removal of pollutant
4.	<b>Immunology &amp; Immunotechnology</b>	Differential WBC counts; Virtual Lab: Removal of spleen and thymus from mice and isolation of lymphocytes; Antigen- antibody interactions by SRID, ODD techniques; virtual lab; ELISA; application of immunotechniques in determinations of blood groups

#### Evaluation Criteria

<b>Components</b>	<b>Maximum Marks</b>
Mid Term Exam	20
End Term Exam	20
Day to Day	60
<b>Total</b>	<b>100</b>

**PBL:** Group of students can prepare report on pollution indicator (enzyme activity) of contaminated soil and water samples from different locations along with the statistical analysis. Students can also work on development of immunotechniques for monitoring of environmental pollutants.

**Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)**

Practical Microbiology Dr. R. C. Dubey and Dr. D. K. Maheshwari, ed 2006, S Chand & Company

Practical Toxicology Evaluation, Prediction, and Risk By David Woolley (Toxicologist), Adam Woolley · 2017,  
CRC Press, Taylor & Francis Group

A Practical Manual for Basic Immunotechniques, January 2009, Edition: 1stPublisher: Samanthi Publications,  
India.ISBN: 978-81 906565 0-4

**Programme Name:** M.Sc Microbiology

**Course Name & Code:** Environmental Microbiology; 19M21BT114

**Brief Outline:**

Fundamentals of Environment & Ecosystem, microbial communities in environment, biogeochemical cycles, diversity of microbes, microbial interactions (microbe-microbe, microbe-plant), microbes and fertility of soil, biofertilizers and biopesticides, microbes in aquatic environments, microbes under extreme environments, types and diversity of extremophiles, waste water treatment, bioremediation types and methods, microbes for biomass, biogas and biofuels, degradation of xenobiotics, microbial technologies for environmental applications, regulations for use of microbes

<b>COURSE OUTCOMES:</b> Upon completion of the course, students will be able to		<b>COGNITIVE LEVELS</b>
CO.1	Explain microbial associations and their contribution to various environments	Understand Level (C2)
CO.2	Identify application potential of microbes in different biotechnology sectors	Apply Level (C3)
CO.3	Make use of research advances in microbe-based technologies concerning microbial ecology and environmental balance	Apply Level (C3)
CO.4	Analyse different aspects of polluted environments and suggest methods of detoxification	Analyze Level (C4)

**CO-PO-PSO Mapping**

COs	PO1	PO2	PO3	PSO1
CO.1	2	1		1
CO.2	2	2		2
CO.3	3	2	3	2
CO.4	2	2	2	2

**Detailed Syllabus**

**Lecture-Wise Breakup**

<b>Course Code</b>	19M21BT114	<b>Semester:</b>	<b>Semester: II</b>	<b>Session : Even 2024</b>
<b>Course Name</b>	Environmental Microbiology			
<b>Credits</b>	3-1-0-4		<b>Contact Hours</b>	4
	<b>Coordinator(s)</b>	Prof. Krishna Sundari		

<b>Faculty (Names)</b>	<b>Teacher(s) (Alphabetically)</b>	1. Prof. Krishna Sundari	
<b>Module No.</b>	<b>Subtitle of the Module</b>	<b>Topics in the module</b>	<b>No. of Lectures for the module</b>
1.	General concept of Microbes, Microbial ecology & Environment	Concept of Microbes with respect to Environment & Ecosystem, Soil as an environment for diverse microorganisms, Understand the biogeochemical cycles, The global carbon cycle and microorganisms, carbon cycle and the green house effect, diversity of microbes, microbial communities in environment	6
2.	Microbial interactions in Environment	Microbial interactions - mutualism, commensalism, amensalism, synergism, parasitism, predation and competition, Microbial interactions with plants– phyllosphere, mycorrhizae, rhizosphere and symbiotic association in root nodules.	4
3.	Microbes under extreme environments	Categories of extremophiles and extremotrophs, Distribution of extremophiles and extremotrophs, Types and diversity of thermophiles, psychrophiles, halophiles, alkaliphiles, acidophiles and barophiles.	3
4.	Microbes for improved soil health	Classification, physical & chemical properties of soil, structure of soil, Soil microbes and fertility of soil, Biotechnology of nitrogen fixation, Biofertilizers and Biopesticides	3
5.	Microbes in aquatic environments & Microbiology of Waste water treatment	Microbes in Aquatic habitats (freshwater & marine), Factors affecting microbial growth, microbial communities and zonation, Principle microbial groups in waste water environment, their role, Treatment of liquid wastes, primary, secondary, tertiary treatment; anaerobic (methanogenesis), aerobic, trickling, activated sludge, oxidation pond	2
6.	Microbes in remediation	Bioremediation types: <i>in situ/ex situ</i> , Treatment of solid wastes: composting, vermi-composting, treatment of liquid wastes, urban, industrial wastes, microbes for heavy metal pollution correction	5

7.	Microbes for biomass utilization	Microbes for utilization of starch and sugars in biomass, biogas and biofuels, research case studies	5
8.	Microbes for degradation of xenobiotics and decontaminating polluted sites	Microbe assisted degradation of xenobiotics, Degrees of biodegradation, Biodegradable, non-biodegradable organic matter, toxicity testing, factors affecting biodegradation and adaptation, Bio-stimulation, Bio-augmentation, Biosorption, Biosensors, Bioindicators	6
9.	Microbial technologies for environmental applications	Application of microbes in industries: Paper & pulp, tanneries, distilleries, food processing & dairy industry, microbes for treatment of Oil spills, radioactive spillage, Biofilters, Bioplastics, Biofilms in industry & environment, Case studies	6
10.	Regulations for use of microbes	Microbes and biosafety levels, regulations for application of microbes in research and environment	2
<b>Total number of Lectures</b>			42
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25	
<b>Total</b>		<b>100</b>	

**PBL component:** students take part as productive team members in projects concerning to microbial ecology, soil and environmental microbiology. Involving reference of quality research papers, understand advanced research methods, real-world learning associating issues in environmental disturbances, involves constructive analytical thinking to offer biotechnological solutions for safer environment

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Prescott's Microbiology, 10 <sup>th</sup> Edition, Eds. Joanne Willey, Linda Sherwood and Christopher J. Woolverton, 2017
2.	Environmental Microbiology, 3rd Edition, Eds: Ian Pepper, Charles Gerba, Terry Gentry, Academic Press, 2014
3.	Environmental Science: toward a Sustainable Future. Richard T Wright, Dorothy F Boorse, 12 <sup>th</sup> Edition, Pearson India education services pvt Ltd., 2015
4.	Basic Environmental technology: water supply, waste management & pollution control, Jerry A Nathanson, Richard A Schneider, VI ed., Pearson India Edu services pvt Ltd., 2017
5.	Research articles from refereed journals.

### Environmental Pollution, Assessment & Monitoring

<b>Subject Code</b>	21M31BT112	<b>Semester</b> Even	<b>Semester: II Session:</b> 2023-24 <b>Month from:</b> January to June
<b>Subject Name</b>	<b>Environmental Pollution, Assessment &amp; Monitoring</b>		
<b>Credits</b>	<b>3-1-0</b>	<b>Contact Hours</b>	<b>4</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Ankisha Vijay
	<b>Teacher(s) (Alphabetically)</b>	Dr. Ankisha Vijay
<b>COURSE OUTCOMES:</b> Upon completion of the course, students will be able to		<b>COGNITIVE LEVELS</b>
CO1	Explain the types and sources of environmental pollution	Understanding Level (C2)
CO2	Detection and assessment of different contaminants and hazards	Apply Level (C3)
CO3	Make use of various remediation and monitoring techniques and apply them in environmental audits	Apply Level (C3)
CO4	Examine modern techniques for the application of environmental monitoring and resource management	Analyze Level (C4)

<b>Module No.</b>	<b>Subtitle of the Module</b>	<b>Topics in the module</b>	<b>No. of Lectures for the module</b>
1.	<b>Environmental Pollution and transport of pollutants in environment</b>	Concept of Environmental Pollution; Origin of pollution; Classification and nature of Environmental Pollutants; Major sources; Impacts of Environmental Pollution at local regional and global level, Dispersal, Reconcentration and Degradation of natural organic compounds and Metal Ions	6
2.	<b>Air pollution</b>	Major air pollutants and their sources; Meteorological aspects of air pollution; Oxides of nitrogen and sulphur; Particulate matter; Air pollution standards; Air pollution episodes and disasters; Effects of air pollution on human health, animals, plants, material and climate; Formation of fog and photochemical smog and acid rain; Monitoring of air pollution; Control on release of smoke; Gaseous contaminants and odour; Control on release of particulate matter by using different control devices	4

3.	<b>Water Pollution</b>	Principal forms of Water Pollutants and their sources; Pollution of stream, lakes and phenomenon of eutrophication; Water pollution monitoring and water quality standards; Ocean pollution – oil pollution; Ground water pollution and its control, Water pollution prevention Chemical methods in monitoring - Detection methods for COD, pH, alkalinity, TSS, TDS, Total organic carbon, oil, grease etc.; Methods of water sampling for pollution analysis; Biosensors - types and applications in environmental pollution detection and monitoring; Biological treatment Methods of monitoring; Biological methods in monitoring ; Detection methods for DO, BOD, Pathogen monitoring by heterotrophic plate count; Multiple tube method; Membrane filtration methods; Other emerging techniques such as enzyme detection, hybridization, PCR, Gene probe technology etc.	6
4.	<b>Noise Pollution</b>	Concept of noise; Sources of noise; Measurement of noise; Religious festival and noise; Standards of noise; Effects of noise on plants, animals and human beings; Control of noise at source; Industrial noise control; Prevention of public noise; Community noise control..	3
5.	<b>Radiation Pollution</b>	Types and possible hazards of radioactive substances; Measurement of radiation intensity; Effects of radioactive waste pollution on environment and impact of radiation on life; Monitoring and control of radiation pollution	3
6.	<b>Soil Pollution</b>	Importance of soil; Concept of soil pollution; Soil acidity, saline and alkaline soil; Causes of soil salinity; Major soil types; Physical, chemical and biological methods of soil reclamation; Different causes of soil degradation; Chemical and metallic pollution of agricultural soil; Mining and soil pollution; Soil pollution and air quality; Control of soil pollution	4
7.	<b>Solid Waste</b>	Concept of solid waste; Industrial solid waste; Domestic solid waste; Agricultural solid waste; Municipal, solid waste; Major sources of solid wastes; Effects of solid waste generation on quality of air, water and public health; Technical approach for solid waste management; Disposal of organic and medical waste; Recovery and recycling of metallic waste; Disposal of plastic waste and hazardous wastes.	4



8.	<b>Environmental Quality Assessment and Monitoring</b>	What is environmental quality? Quality of environment for life on earth and man; Deterioration of environmental quality with reference to anthropogenic impact; Methods of assessment of environmental quality; Short term studies/surveys; Rapid assessment; Continuous short and long term monitoring.	3
9.	<b>Environmental Impact Assessment (EIA)</b>	Need of EIA; Scope and objectives; Types of environmental impacts; Steps involved in conducting the EIA Studies; Environmental Impact Assessment techniques-Ad-hoc method, checklist method, overlay mapping method, network method, simulation and modeling technique, matrix method, and system diagram technique; Merits and Demerits of EIA studies	3
10.	<b>Principles of Remote sensing, its applications in Environmental Monitoring</b>	Concept of Remote sensing; EMR & its interaction with matter; Aerial Photography: Types, Camera, Elements of photo interpretation (Aerial Photography/image recognition); Sensors & platforms; IRS satellites & their sensors; Application of remote sensing in environmental studies	3
11.	<b>Geographical Information System (GIS)</b>	Concept of GIS; Types of Geographical Data; Data Structure; Vector and Raster data: their Advantages and Disadvantages; Input, verification, storage and out put of geographical data; Importance of Geographical Information System in environmental studies	3
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (class test, PBL)	
<b>Total</b>		<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	S. Glasstone, D. Van Nastrand, Source book on atomic energy, 3rd Edition, Germany, 1967
2.	M. Eisendbud, Environmental radioactivity, , Academic Press
3.	E.D.Enger, B.E. Smith, Environmental Science- A study of Inter relationships, WCB Publication
4.	Christon J. Hurst, Ronald L. Crawford, Guy R. Knudsen, Michael J. McInerney, Manual of Environmental Microbiology, 2nd edition, ASM Press. 2001.

5.	Foin, Ecological Systems and the Environment – I
6.	Mizrahi & Wezel, Advances in Biotechnological Process, Raina M. Maier, Ian L. Pepper, Charles P. Gerba. Environmental Microbiology, Academic Press, 2000.
7.	Gabriel Bitton, Wastewater Microbiology, 2nd Edition. Wiley-Liss; 2nd Edition, 1999
8.	Martin Alexander, Biodegradation and Bioremediation, 2nd Edition, Academic Press, 1999.
9.	Bruce Rittman, Perry L. McCarty. Environmental Biotechnology: Principles and Applications, 2nd Edition McGraw-Hill, 2000.

**Environmental Toxicology (20M31BT113) NBA Code: C-125**

<b>Course Code</b>	21M31BT113	<b>Semester</b> : Even	<b>Semester: II</b> <b>Session : 2023-24</b> <b>Month from: January to June</b>	
<b>Course Name</b>	<b>Environmental Toxicology</b>		<b>Course Coordinators: Dr Ekta Bhatt</b>	
<b>Credits</b>	3-1-0		<b>Contact Hours</b>	<b>4</b>
<b>COURSE OUTCOMES:</b> Upon completion of the course, students will be able to			<b>COGNITIVE LEVELS</b>	
<b>CO1</b>	Identify types of toxicants and pertinent environment legislations and regulations		Understanding Level (C2)	
<b>CO2</b>	Explain origin, properties and impact of organic, inorganic pollutants on the environment		Apply Level (C3)	
<b>CO3</b>	Interpret the risks and fate of environmental toxicants in relation to biotic forms and human health		Apply Level (C3)	
<b>CO4</b>	Analyze environmental toxicological issues and health risks		Analysis Level (C4)	
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>		<b>Dr Ekta Bhatt</b>	
	<b>Teacher(s) (Alphabetically)</b>		Dr. Sonam Chawla Dr. Ekta Bhatt	
<b>Module</b>	<b>Name of module</b>	<b>Topics</b>		<b># of Lectures</b>
<b>1</b>	<b>Environmental Toxicants: Classification based on usage</b>	Exposure Classes, Toxicants in Air, Water, Soil, Domestic, and Occupational Settings: Metals, Insecticides, Pesticides, Fumigants, Food additives, Solvents, Therapeutic drugs, Biological toxins		<b>5</b>
<b>2.</b>	<b>Biological Effects of Toxicants in plants and animals systems</b>	Exposure, uptake, transport, injury, storage and metabolism, excretion of toxicants in plants and animals systems. Mechanism of action of toxicants - impact and interaction on cellular structure , enzymes, initiation of free radical reactions, endocrine disruption		<b>6</b>
<b>3</b>	<b>Genotoxicity and disease incidence</b>	Concept of Genotoxicity and Mutagenesis: mechanisms and agents. environmental toxicants as carcinogens and teratogens, testing for genotoxicity.		<b>5</b>
<b>4</b>	<b>Testing for Environmental Toxicant</b>	Dose–Response Relationships, Cell Culture Techniques for toxicity testing, Indicators of Toxicity in Cultured Cells, Immunochemical techniques, Toxicity Tests in Animals.		<b>5</b>
<b>5.</b>	<b>Toxicogenomics and <i>in silico</i></b>	Introduction to toxicogenomics, toxicogenomics databases, prediction tools for toxicity		<b>3</b>

<b>Course Code</b>	21M31BT113	<b>Semester</b> : Even	<b>Semester: II</b> <b>Session : 2023-24</b> <b>Month from: January to June</b>
<b>Course Name</b>	<b>Environmental Toxicology</b>		<b>Course Coordinators: Dr Ekta Bhatt</b>
<b>Credits</b>	3-1-0		<b>Contact Hours</b> <b>4</b>
	<b>Toxicology evaluation</b>		
<b>6.</b>	<b>Health Risk Assessment of toxicants</b>	Introduction to the concept of Health Risk Assessment (HRA)  Case studies on HRA of toxicants in consumer products, indoor pollutants, water/air/soil pollution (pesticides, metals and metalloids, VOCs)	<b>7</b>
<b>7</b>	<b>Legal Aspects of Environmental Toxicology</b>	Legislation concerning air and water pollution, pesticide use, consumer protection, and occupational exposure to toxic substances; roles of regulatory agencies. The United Nations Conference on Environment and Development: The Earth Summit	<b>5</b>
<b>8</b>	<b>Toxic Tragedies and Their Impact on Society</b>	OCCURRENCE OF TOXICANTS, Injuries to Humans, Acute and Chronic Effects (Case studies) : London, England, 1952/ Los Angeles, California, U.S., 1954/ Bhopal, India, 1984/ Gas Well Accident, Gaoqiao, China, 2003	<b>6</b>
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25	
<b>Total</b>		<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
<b>1.</b>	Sigmund F. Zakrzewski, Environmental Toxicology, 3rd, Oxford University Press, 2002, New York
<b>2.</b>	Ming Ho Yu, Humio Tsunoda, Masashi Tsunoda Environmental Toxicology: Biological and Health Effects of Pollutants, 3rd Edition, CRC Press, USA, 2011
<b>3.</b>	Review articles and research articles from high impact journals

## Detailed Syllabus

### Lecture-wise Breakup

<b>Course Code</b>	19M11BT116	<b>Semester : Even</b>	<b>Semester</b> M.Sc. Microbiology/Env Biotechnology <b>Session</b> 2023 -2024 <b>Month</b> from January - June
<b>Subject Name</b>	<b>Immunology and Immunotechnology</b>		
<b>Credits</b>	<b>4</b>	<b>Contact Hours</b>	<b>4</b>
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Rachana	
	<b>Teacher(s) (Alphabetically)</b>	Dr. Rachana, Dr. Shalini Mani	
CO116.1	Explain the role of the Immune system in human health and diseases.	<b>(C2) Understand Level</b>	
CO116.2	Utilise immunological techniques for diagnosis of various diseases.	<b>(C3) Apply Level</b>	
CO116.3	Make use of antibody engineering for various applications.	<b>(C3) Apply Level</b>	
CO116.4	Analyse advanced Immunological principles and technology for clinical purposes.	<b>(C4) Analyze Level</b>	

<b>Module No.</b>	<b>Subtitle of the Module</b>	<b>Topics in the module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	Component of Immune system	Cells and organs of immune system, Innate immunity, adaptive immunity, B cell receptor, T cell receptor	<b>6</b>
<b>2.</b>	Regulation of immune response	Antigen presentation, MHC molecules, Cytokines, Complement systems	4
<b>3</b>	Diseases related to immune system	Autoimmune diseases, hypersensitivity reactions, Immune deficiency, cancer, infectious diseases.	5
<b>4</b>	Organ and tissue transplantation	HLA typing, graft rejection, graft acceptance, case studies.	3

5	Antibody engineering	Antibody diversity, Polyclonal antibody, Hybridoma Technology and its application, Humanized antibody, Phage display technology.	6
6	Immunotechnology	Theory, cross reactivity, precipitation reactions, agglutination reactions, ABO blood grouping, Ouchterlony, Western blotting, Elispot, immunofluorescence (IHC, FACS), ELISA, Kits for diseases. RIA	10
7	Vaccine Technology and its application	Adjuvants, live, attenuated, killed, inactivated, toxoids, recombinants, sub unit, conjugate and DNA vaccines	4
8	Immunotherapy	Passive immunization, activation of NK cells, T Cells, generation of antibody	4
<b>Total number of Lectures</b>			42

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Immunology (3 <sup>rd</sup> edition ) Janus Kuby W.H. Freeman and company
2.	<b>Essentials of Immunogy</b> Ivan- Roit; 6 <sup>th</sup> edition (1988); Blackwell Publ
3.	<b>Antibodies A laboratory Manual</b> Harlow and David Lane, Old spring Harbor Laboratory
4.	<b>Immunology – A Short Course,</b> Richard Coico, <i>et al.</i> 5th Ed., Wiley – Liss, 2003.
5.	<b>Immunology, 4th Ed</b> Richard Hyde. Lippincott Wilkins & Wilkins, 2000.
6.	<b>Microbiology &amp; Immunology Online.</b> Richard Hunt. Univ South Carolina, School of Medicine, <a href="http://pathmicro.med.sc.edu/book/immunol-sta.htm">http://pathmicro.med.sc.edu/book/immunol-sta.htm</a>
7.	Cellular and Molecular Immunology 9th Edition Abul Abbas Andrew H. Lichtman Shiv Pillai, Elsevier, 2019 <a href="https://www.worldcat.org/title/cellular-and-molecular-immunology/oclc/1108702033?referer=di&amp;ht=edition">https://www.worldcat.org/title/cellular-and-molecular-immunology/oclc/1108702033?referer=di&amp;ht=edition</a>

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	<b>19M22BT214</b>	<b>Semester ODD</b> (specify Odd/Even)	<b>Semester X Session 2021 -2022</b> <b>Month from JULY - DECEMBER</b>
<b>Course Name</b>	<b>PUBLIC HEALTH</b>		
<b>Credits</b>	3	<b>Contact Hours</b>	3

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	DR. ASHWANI MATHUR
	<b>Teacher(s) (Alphabetically)</b>	DR. ASHWANI MATHUR

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO1</b>	Understanding Government policies , socio-economic conditions and their role in Public Health	Understanding (Level 2)
<b>CO2</b>	Explain fundamentals of disease epidemiology and pathogenesis	Understanding (Level 2)
<b>CO3</b>	Using health indicators and other secondary data in ethical public health research	Applying (Level 3)
<b>CO4</b>	Analysis of the role of health care in policy making	Analyzing (Level 4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	Importance of Public Health	Introduction to Public Health, Health Promotion and Disease Prevention, Relevance of policy response in public health, Public health research methods – qualitative and quantitative methods, Role of ethics in research	<b>8</b>
<b>2.</b>	Basic Epidemiology	Introduction to Fundamentals of Epidemiology; Disease- History, prevention and intervention; measurement of occurrence, effect and impact; cohort studies	<b>7</b>
<b>3.</b>	Microbial pathogenesis	Introduction to Pathogenesis, microbial pathogens from water, soil and air. Viral pathogenesis, Impact of pathogenic organisms on public health, discussion of case study of Covid-19	<b>7</b>
<b>4.</b>	Health indicators and their role in data analysis	Understanding of Universal indicators, HDI, LE, Mortality and Morbidity; Use of indicators for understanding epidemiology of disease	<b>7</b>

5.	Public Health medicines	Introduction to social medicine, community medicine and , prospective and retrospective research design for epidemiological studies	4
6.	Public Health ethics and Laws	The ethics and legal aspects of public health, Health Insurance Portability and Accountability Act in Public Health	
6.	Health Policy Analysis	Policy analysis process; health care and health policy; Role of government in policy making; Policy analysis process- identification, evaluation (technology assessment; economic viability)	5
<b>Total number of Lectures</b>			42
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Assignment / Class Test-1 & 2)	
<b>Total</b>		<b>100</b>	

**Project Based Learning: Students will understand the importance of Public Health Indicators and their use in analysis of disease epidemiology and pathogenesis. The students will be using these indicators to learn preparing life tables and also use it to analyze the role of indicators in policy making. Students will learn the facets of government policy in the health of public health and hygiene.**

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	<b>Schneider, M-J. Introduction to Public Health. Jones and Bartlett Publishers, USA</b>
2.	<b>Bhattacharya, J., Hyde, T., Tu, P. Health Economics. Palgrave Macmillan</b>
3.	<b>Drummond M., et al. Methods for the Economic Evaluation of health care programmes. Oxford University Press</b>
4.	<b>Johannesson, Magnus. Theory and Methods of Economic Evaluation of Healthcare. Springer Science Business Media</b>