Semester: II
Core Course
8. Course Code & Title: MPC 52 03 & Epidemiology of Communicable & Non-Communicable Diseases
Credits: 4

Course objectives:

The objective of this course is to make students understand the major non-communicable diseases, their risk factors, strategies for prevention, risk factor surveillance as per the World Health Organization STEPS protocol, case studies on major interventions to reduce risk factors in India and a few other developing countries and the national program for prevention and control of Cancer, Cardiovascular diseases, Diabetes and Stroke in India.

Course outcomes:

On successful completion of this course, students will be able to:

1) Understand the key concepts pertaining to communicable/infectious diseases, their transmission mechanisms, communicable disease surveillance and infectious disease outbreak response systems.
2) Develop conceptual understanding of epidemiology of communicable and non-communicable diseases.
3) Conduct outbreak investigation and suggest infectious disease containment strategies
4) Identify etiology and risk factors and develop strategies to prevent and control communicable and non-communicable diseases.
5) Apply multi-disciplinary methods (such as mathematical modelling, digital health technologies etc.,) in addressing the challenges of communicable and non-communicable diseases.

Skills Developed:

On successful completion of the course the students shall develop skills in Non-communicable disease surveillance, out-break investigation of infectious diseases, communicable and non-communicable disease prevention and manifest understanding of vaccine development process.

Teaching methods: This course will be delivered using a variety of methods and modalities such as interactive classroom and online lectures, self-study, case studies, written assignment, class room exercises using computers, quiz, field visit, group work, field survey, class room presentations in groups etc.

Units and Topics	Teaching Methods	Mandatory Readings

Unit-I: Non-Communicable Diseases									
	L	**FW**	**FV**	**CS**	**GW**	**SS**	**SP**	**P**	
Objectives of the course	**X**								
Epidemiological Transition	**X**					**X**			Omran., A, R. The epidemiologic transition: a theory of the epidemiology of population change. 1971. *Milbank Q*. 2005;83(4):731-757.
NCD Risk factor Surveillance	**X**					**X**			Riley, L., Guthold, R., Cowan, M., Savin, S., Bhatti, L., Armstrong, T., & Bonita, R. (2016). The World Health Organization STEP-WISE Approach to Noncommunicable Disease Risk-Factor Surveillance: Methods, Challenges, and Opportunities. *American Journal of Public Health*, *106*(1), 74–78. https://doi.org/10.2105/AJPH.2015.302962
NCD Risk factor Surveillance STEP 1	**X**					**X**		**X**	Sarma, P. S., Sadanandan, R., & Thulaseedharan , J. V. et al (2019). Prevalence of Risk Factors of Non-Communicable Diseases in Kerala, India: Results of a Cross-Sectional Study. *BMJ Open*, *9*(11), e027880. https://doi.org/10.1136/bmjopen-2018-027880
NCD Risk factor Surveillance STEP 2 and 3	**X**					**X**		**X**	
Risk factor Modification	**X**					**X**			Puska, P., Laatikainen, T., Korpelainen, V., & Vartiainen, E. (2016). Contribution of the North Karelia Project to International Work in CVD and NCD Prevention and Health Promotion. *Global Heart*, *11*(2), 243–246. https://doi.org/10.1016/j.gheart.2016.04.009
Strategies of Prevention.	**X**					**X**			Rose, G. (2001). Sick Individuals and sick populations. *International Journal of Epidemiology*, *30*(3), 427–432. https://doi.org/10.1093/ije/30.3.427
Risk factors of NCDs: Tobacco, overall	**X**					**X**			WHO Tobacco: fact sheet. Geneva: World Health Organization, 2018. https://www.who.int/en/news-room/fact-sheets/detail/tobacco
Risk factors of NCDs: Tobacco, FCTC	**X**					**X**			Mohan, S., Mini, G. K., & Thankappan, K. R. (2013). High Knowledge of Framework Convention on Tobacco Control Provisions Among Local Government Representatives Does Not Translate into Effective Implementation: Findings from Kerala, India. *Public Health*, *127*(2), 178. https://doi.org/10.1016/j.puhe.2012.11.018

Risk factors of NCDs: Physical inactivity & Public Health	**X**					**X**			Mathews, E., Pratt, M., Jissa, V. T., & Thankappan, K. R. (2015). Self-reported Physical Activity and Its Correlates Among Adult Women in the Expanded Part of Thiruvananthapuram City, India. *Indian Journal of Public Health*, *59*(2), 136–140. https://doi.org/10.4103/0019-557X.157535
Risk factors of NCDs: Physical inactivity, methodology for measurements	**X**					**X**			Mathews, E., Salvo, D., Sarma, P., Thankappan, K., & Pratt, M. (2016). Adapting and Validating the Global Physical Activity Questionnaire (GPAQ) for Trivandrum, India, 2013. *Preventing Chronic Diseases*, *13*, E53. https://doi.org/10.5888/pcd13.150528.
Risk factors of NCDs: Unhealthy Diet	**X**					**X**			GBD 2017 Diet Collaborators. (2019). Health Effects of Dietary Risks in 195 Countries, 1990-2017: A Systematic Analysis for the Global Burden of Disease Study 2017. *Lancet*, *393*(10184), 1958. https://doi.org/10.1016/S0140-6736(19)30041-8
Risk Factors of NCDs: Alcohol use	**X**					**X**			GBD 2016 Alcohol Collaborators. (2018). Alcohol Use and Burden for 195 Countries and Territories, 1990-2016: A Systematic Analysis for the Global Burden of Disease Study 2016. *Lancet*, *392*(10152), 1015. https://doi.org/10.1016/S0140-6736(18)31310-2
Case studies on interventions for NCD risk reduction 1. Quit Tobacco International	**X**					**X**			Yamini , T. R., Nichter, M., Nichter, M. et al. (2015). Developing a Fully Integrated Tobacco Curriculum in Medical Colleges in India. *BMC Medical Education*, *15*, 15. https://doi.org/10.1186/s12909-015-0369-3.
Case Study 2. Dietary intervention	**X**					**X**			Daivadanam, M., Wahlstrom, R., Ravindran , T. K. S., Sarma, P. S., Sivasankaran, S., & Thankappan, K. R. (2018). Changing Household Dietary Behaviours Through Community-Based Networks: A Pragmatic Cluster Randomized Controlled Trial in Rural Kerala, India. *PloS One*, *13*(8), e0201877. https://doi.org/10.1371/journal.pone.0201877
Case Study 3. Kerala Diabetes Prevention Program	**X**					**X**			Thankappan, K. R., Sathish, T., & Tapp, R. J. (2018). A Peer-Support Lifestyle Intervention for Preventing Type 2 Diabetes in India: A Cluster-Randomized Controlled Trial of the Kerala Diabetes Prevention Program. *PLOS Medicine*, *15*(6), e1002575. https://doi.org/10.1371/journal.pmed.1002575
Case study 4. Community Interventions for Health	**X**					**X**			Dyson, P. A., Anthony, D., Fenton, B. et al. (2015). Successful Up-Scaled Population Interventions to Reduce Risk Factors for Non-Communicable Disease in Adults: Results From the International Community Interventions

									for Health (CIH) Project in China, India and Mexico . *PloS One* , *10*(4), e0120941. https://doi.org/10.1371/journal.pone.0120941
National program for the prevention and control of Cancer, cardiovascular diseases, diabetes and stroke	**X**				**X**	**X**	**X**		Krishnan, A., Gupta, V., Ritvik, Nongkynrih, B., & Thakur, J. S. (2011). How to Effectively Monitor and Evaluate NCD Programmes in India . *Indian Journal of Community Medicine* , *36*, S57-62.
Unit-II: Communicable Diseases									
2.1. Introduction to Infectious Disease Epidemiology (IDE) - Principles of IDE - Key Terminologies used in IDE - Burden of Infectious Diseases - Transmission of infectious diseases - Classification of infectious diseases - Notifiable diseases	**X**			**X**	**X**		**X**	**X**	Nelson, K. E., & Williams, C. M. (Eds.). (2014). Infectious disease epidemiology: theory and practice. Jones & Bartlett Publishers. Stein, R. A. (2011). Super-spreaders in infectious diseases. *International Journal of Infectious Diseases*, *15*(8), e510-e513.Available at https://www.sciencedirect.com/science/article/pii/S1201971211000245
2.2. Prevention and management of Infectious diseases - Immunity (Active immunity, passive immunity, heard immunity) - Vaccine development and deployment (phases of vaccine development, vaccine efficacy and effectiveness, vaccination strategies, critical vaccination coverage)	**X**				**X**		**X**		Altmann, D. M., Douek, D. C., & Boyton, R. J. (2020). What policy makers need to know about COVID-19 protective immunity. *The Lancet*, *395*(10236), 1527-1529.available at https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30985-5/fulltext Randolph, H. E., & Barreiro, L. B. (2020). Herd Immunity: Understanding COVID-19. *Immunity*, *52*(5), 737-741. Available at https://www.sciencedirect.com/science/article/pii/S1074761320301709 Doherty, M., Buchy, P., Standaert, B., Giaquinto, C., & Prado-Cohrs, D. (2016). Vaccine impact: benefits for human health. *Vaccine*, *34*(52), 6707-6714. Available at https://www.sciencedirect.com/science/article/pii/S0264410X16309434 Anderson, R. M., & May, R. M. (1985). Vaccination and herd immunity to infectious diseases. *Nature*, *318*(6044), 323-329. Available at https://www.nature.com/articles/318323a0.pdf Leroux-Roels, G., Bonanni, P., Tantawichien, T., & Zepp, F. (2011). Vaccine development. *Perspectives in Vaccinology*, *1*(1), 115-150. Available at

									https://www.researchgate.net/profile/Terapong_Tantawichien/publication/257740127_Vaccine_development/links/00b7d53a6f1e3c5748000000.pdf
2.3. Infectious disease outbreaks - Types of infectious disease outbreak - Outbreak investigation	**X**			**X**		**X**			Arunkumar, G., Chandni, R., Mourya, D. T., Singh, S. K., Sadanandan, R., Sudan, P., & Bhargava, B. (2019). Outbreak investigation of Nipah virus disease in Kerala, India, 2018. *The Journal of infectious diseases*, *219*(12), 1867-1878. Available at https://academic.oup.com/jid/article/219/12/1867/5144922
2.4 Infectious disease surveillance	**X**			**X**			**X**		Thurmond, M. C. (2003). Conceptual foundations for infectious disease surveillance. Journal of veterinary diagnostic investigation, 15(6), 501-514. Hashimoto, S., Murakami, Y., Taniguchi, K., & Nagai, M. (2000). Detection of epidemics in their early stage through infectious disease surveillance. International journal of epidemiology, 29(5), 905-910. Gianicolo, E., Riccetti, N., Blettner, M., & Karch, A. (2020). Epidemiological Measures in the Context of the COVID-19 Pandemic. Deutsches Ärzteblatt International, 117(19), 336. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7207201/
2.5 Mathematical modelling of infectious diseases - Basic reproductive number (R_0) - Types of mathematical models used for modelling infectious diseases - SIR, SEIR and SEIRS models - Dynamics in SIR models (influence of birth, death and migration)	**X**					**X**		**X**	Heffernan, J. M., Smith, R. J., & Wahl, L. M. (2005). Perspectives on the basic reproductive ratio. *Journal of the Royal Society Interface*, *2*(4), 281-293. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1578275/ Shrestha, S., & Lloyd-Smith, J. O. (2010). Introduction to mathematical modeling of infectious diseases. *Modeling Paradigms and Analysis of Disease Transmission Models*, *75*, 1. Available at http://www.academia.edu/download/38600599/Shrestha2010.pdf
2.6 Climate change and social determinants as risk factors for infectious diseases	**X**			**X**		**X**			Patz, J. A., Githeko, A. K., McCarty, J. P., Hussein, S., Confalonieri, U., & De Wet, N. (2003). Climate change and infectious diseases. Climate change and human health: risks and responses, 2, 103-32. Available at http://www.debok.net/pdf/9191819274.pdf Semenza, J. C., Suk, J. E., & Tsolova, S. (2010). Social determinants of infectious diseases: a public health priority. *Eurosurveillance*, *15*(27), 19608.

									Bishwajit, G., Ide, S., & Ghosh, S. (2014). Social determinants of infectious diseases in South Asia. *International scholarly research notices*, *2014*. https://downloads.hindawi.com/archive/2014/135243.pdf
2.7 Emerging and reemerging infectious diseases	**X**			**X**		**X**			Morens, D. M., Folkers, G. K., & Fauci, A. S. (2004). The challenge of emerging and re-emerging infectious diseases. Nature, 430(6996), 242-249. Available at https://www.nature.com/articles/nature02759
2.8 Laws and regulations concerning communicable diseases	**X**			**X**		**X**			Fidler, D. P. (1996). Globalization, international law, and emerging infectious diseases. Emerging infectious diseases, 2(2), 77. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2639823/pdf/8903206.pdf Aginam, O. (2002). International law and communicable diseases. *Bulletin of the World Health Organization*, *80*, 946-951. Available at https://www.scielosp.org/article/bwho/2002.v80n12/946-951/pt/ Bahurupi, Y., Mehta, A., Singh, M., Aggarwal, P., & Kishore, S. (2020). Epidemic diseases act 1897 to public health bill 2017: Addressing the epidemic challenges. *Indian Journal of Public Health*, *64*(6), 253-255. Draft PHPCM of Epidemics, Bio-Terrorism and Disasters Bill (2017). Available from: https://www.prsindia.org/uploads/media/draft/Draft%20PHPCM%20of%20Epidemics,%20Bio-Terrorism%20and%20Disasters%20Bill,%202017.pdf
2.9 Digital health technologies in Infectious disease prevention and control.	**X**			**X**		**X**			Hay, S. I., George, D. B., Moyes, C. L., & Brownstein, J. S. (2013). Big data opportunities for global infectious disease surveillance. PLoS med, 10(4). Robertson, C., Sawford, K., Daniel, S. L., Nelson, T. A., & Stephen, C. (2010). Mobile phone–based infectious disease surveillance system, Sri Lanka. Emerging infectious diseases, 16(10), 1524. Choi, J., Cho, Y., Shim, E., & Woo, H. (2016). Web-based infectious disease surveillance systems and public health perspectives: a systematic review. *BMC public health*, *16*(1), 1238.

L- Lecture; FW- Field work; FV - Field Visit; CS - Case study; GW- Group work; SS- Self-study; SP- Seminar presentation; P-Practical

Evaluation
As per CBCS guidelines, this course will be evaluated for 100 marks with a Continuous Evaluation (CA) component of 40 marks and End-Semester Evaluation (ESA) component of 60 marks.

Additional readings
Nelson, K. E., & Williams, C. M. (Eds.). (2014). Infectious disease epidemiology: theory and practice. Jones & Bartlett Publishers.