

Department of Gender Studies
Faculty of Behavioral and Social Sciences
University of the Punjab, Lahore
Course Outline



Program	BS Gender Studies	Course Code	NS-125	Credit Hours	3
Course Title	Science of Global Challenges				
Course Introduction					
<p>Our world has seen a massive transformation in the past 200 years. The progress that we see around ourselves is largely owed to the advancement in Scientific knowledge that has enabled us to harness Nature’s resources in a multitude of ways. This progress however has come at a great cost, including a threat to our own existence. Through this course, we will discuss some of the core challenges mankind is facing, the scientific reasoning behind all these challenges and the actions that must be taken to create a future free of these problems. The three main areas we will focus on include Climate Change, The Energy Crisis and the survival of humanity in the wake of deadly viruses and infectious diseases.</p>					
Learning Outcomes					
<p>On the completion of the course, the students will:</p> <ol style="list-style-type: none"> 1. Explain the scientific principles that help understand the key challenges we are facing today 2. Describe natural systems modulating the Earth's climate, articulate causes and consequences of anthropogenic climate change, and discuss measures to curb global greenhouse gas emissions. 3. Differentiate between renewable and nonrenewable systems 4. Explain the working principles of various renewable systems and devices including solar photovoltaics, wind mills, hydro power, geo thermal and bio energy 5. Explain the working principle of key biological ideas including viruses and diseases, evolution by natural and artificial selection 6. Demonstrate an understanding of the deep connection between science, technology and society 					
Course Content			Assignments/Readings		
Week 1	Unit-I: Climate change 1.1 Introduction and Framing 1.2 What is the greenhouse effect?		Bedford, D., Cook, J. (2023). Climate Change: Examining the Facts. United Kingdom: Bloomsbury Academic.		
	1.3 Challenges and risks of climate change 1.4 Geologic History and Planetary Processes				
Week 2	1.5 Oceans: How do ocean currents regulate global climate 1.6 Atmosphere: How do large scale wind patterns affect global climate		Bedford, D., Cook, J. (2023). Climate Change: Examining the Facts. United Kingdom: Bloomsbury Academic.		
	1.7 Ecosystems: Climate constrain ecosystems, ecosystems impact global				

	<p>climate</p> <p>1.8 Projections of future climate, Measuring anthropogenic climate change</p> <p>1.9 What are GCMs? Carbon emission scenarios, Sustainability</p>	Kingdom: Bloomsbury Academic.
Week 3	<p>Unit – 2: Energy</p> <p>2.1 Science of Energy: Forms of Energy, Energy Conversion</p> <p>2.2 Sustainability of Energy Systems</p>	Raymond, C., Wirth, T., Di, M. A., Williams, D. R., & Manzo, L. (2021). Changing senses of place: Navigating global challenges. Cambridge University Press.
	<p>2.3 Working of renewable devices. How do solar cells operate?</p> <p>2.4 Photoelectric effect, intro to semiconductors and band gaps, Wind energy, Wind mills, Physics of a generator</p>	Raymond, C., Wirth, T., Di, M. A., Williams, D. R., & Manzo, L. (2021). Changing senses of place: Navigating global challenges. Cambridge University Press.
Week 4	<p>2.5 Energy quantification - Energy needs, available resources, renewable vs nonrenewable, challenge of current practices.</p> <p>2.6 Future of Energy</p>	Raymond, C., Wirth, T., Di, M. A., Williams, D. R., & Manzo, L. (2021). Changing senses of place: Navigating global challenges. Cambridge University Press.
	<p>2.7 Geopolitics of Global Energy</p> <p>2.8 Energy Hazards & Disasters: Chernobyl and Kobe</p>	Raymond, C., Wirth, T., Di, M. A., Williams, D. R., & Manzo, L. (2021). Changing senses of place: Navigating global challenges. Cambridge University Press.
Week 5	<p>Unit – 3: Human survival and infectious disease</p> <p>3.1 What are infectious diseases</p> <p>3.2 Types of infectious diseases</p>	Raymond, C., Wirth, T., Di, M. A., Williams, D. R., & Manzo, L. (2021). Changing senses of place: Navigating global challenges. Cambridge University Press.
	<p>3.3 History of Germs, Vaccines and Diseases</p> <p>3.4 Evolution by Natural and Artificial Selection</p>	<p>Wilkinson, A., & Flowers, B. S. (2018). Realistic hope: Facing global challenges. Amsterdam: Amsterdam University Press.</p> <p>Raymond, C., Wirth, T., Di, M. A., Williams, D. R., & Manzo, L. (2021). Changing senses of place: Navigating global challenges. Cambridge University Press.</p> <p>Wilkinson, A., & Flowers, B. S. (2018). Realistic hope: Facing global challenges. Amsterdam: Amsterdam University Press.</p>
Week 6	<p>3.5 Why are viruses crossing species barrier?</p> <p>3.6 Anti-biotic resistance</p>	Raymond, C., Wirth, T., Di, M. A., Williams, D. R., & Manzo, L. (2021). Changing senses of place: Navigating global challenges. Cambridge University Press.

		Wilkinson, A., & Flowers, B. S. (2018). <i>Realistic hope: Facing global challenges</i> . Amsterdam: Amsterdam University Press.
	3.7 Human physiological limits 3.8 Changing interactions and new diseases	Raymond, C., Wirth, T., Di, M. A., Williams, D. R., & Manzo, L. (2021). <i>Changing senses of place: Navigating global challenges</i> . Cambridge University Press. Wilkinson, A., & Flowers, B. S. (2018). <i>Realistic hope: Facing global challenges</i> . Amsterdam: Amsterdam University Press.
Week 7	Unit – 4: Science, technology and society 4.1 Complex web of science, politics and social systems 4.2 Development of Science in certain areas, Role of Wars	Grand Challenges For Science In The 21 st Century. (2018). Singapore: World Scientific Publishing Company.
	4.3 Scientific Funding: Sources, gatekeepers and culture of scientific funding 4.4 Technological Progress and Ethical constraints 4.5 Human experiences as Data	Grand Challenges For Science In The 21 st Century. (2018). Singapore: World Scientific Publishing Company.
Week 8	Course Review	
	Midterm Examination	
Week 9	Unit—5: Artificial Intelligence 5.1 What is artificial intelligence 5.2 AI: possibilities and limitations	Fui-Hoon Nah, F., Zheng, R., Cai, J., Siau, K., & Chen, L. (2023). Generative AI and ChatGPT: Applications, challenges, and AI-human collaboration. <i>Journal of Information Technology Case and Application Research</i> , 25(3), 277-304.
	5.3 How the AI revolution is reshaping the world?	
Week 10	5.4: AI: Impact on business and organizations	Makridakis, S. (2017). The forthcoming Artificial Intelligence (AI) revolution: Its impact on society and firms. <i>Futures</i> , 90, 46-60.
	5.5 AI in health sector	Cutler, D. M. (2023, July). What artificial intelligence means for health care. In <i>JAMA Health Forum</i> (Vol. 4, No. 7, pp. e232652-e232652). American Medical Association.
Week 11	5.6 AI in education sector	Kamalov, F., Santandreu Calonge,

		D., & Gurrib, I. (2023). New era of artificial intelligence in education: Towards a sustainable multifaceted revolution. <i>Sustainability</i> , 15(16), 12451.
	5.7 What AI means for national and international security?	Kopanja, M. V. (2023). Artificial intelligence and international security: The upcoming revolution in military affairs. <i>Sociološki pregled</i> , 57(1), 102-123.
Week 12	5.8 AI for developmental opportunities in the third world	Mannuru, N. R., Shahriar, S., Teel, Z. A., Wang, T., Lund, B. D., Tijani, S., ... & Vaidya, P. (2023). Artificial intelligence in developing countries: The impact of generative artificial intelligence (AI) technologies for development. <i>Information Development</i> , 02666669231200628.
	Unit – 6: The Future of Science: Nanotechnology and Biotechnology 6.1 Nanotechnology and its future applications in Medicine, Food, Computational Systems, Energy	Renneberg, R. (2023). <i>Biotechnology for beginners</i> . Academic Press. Suhag, D., Thakur, P., & Thakur, A. (2023). Introduction to nanotechnology. <i>Integrated Nanomaterials and their Applications</i> , 1-17.
Week 13	6.2 Biotechnology and its applications 6.3 Future of foods: Agricultural production, consumption and nutrition	Renneberg, R. (2023). <i>Biotechnology for beginners</i> . Academic Press.
	6.4 Genetic Modification: CRISPR, Gene Therapy 6.5 Genome project and global gene banks	Renneberg, R. (2023). <i>Biotechnology for beginners</i> . Academic Press. Wilkinson, A., & Flowers, B. S. (2018). <i>Realistic hope: Facing global challenges</i> . Amsterdam: Amsterdam University Press.
Week 14	6.6 Brain-mapping, autonomous therapeutic systems and cellular anti-ageing research 6.7 Microbiome Manipulation 6.8 Living medicine	Renneberg, R. (2023). <i>Biotechnology for beginners</i> . Academic Press. Wilkinson, A., & Flowers, B. S. (2018). <i>Realistic hope: Facing global challenges</i> . Amsterdam: Amsterdam University Press.
	6.9 Exobiology – Life and humans outside of Earth	Raymond, C., Wirth, T., Di, M. A., Williams, D. R., & Manzo, L. (2021). <i>Changing senses of place: Navigating global challenges</i> . Cambridge University Press.

Week 15	Students' Presentations/ Poster competition	
	Students' Presentations/ Poster competition	
Week 16	Final term exams	
Textbooks and Reading Material		
<p>1. Textbooks.</p> <p>1.1 Bedford, D., Cook, J. (2023). Climate Change: Examining the Facts. United Kingdom: Bloomsbury Academic.</p> <p>1.2 Renneberg, R. (2023). Biotechnology for beginners. Academic Press.</p> <p>1.3 Suhag, D., Thakur, P., & Thakur, A. (2023). Introduction to nanotechnology. Integrated Nanomaterials and their Applications, 1-17.</p> <p>1.4 Grand Challenges For Science In The 21st Century. (2018). Singapore: World Scientific Publishing Company.</p> <p>1.5 Raymond, C., Wirth, T., Di, M. A., Williams, D. R., & Manzo, L. (2021). Changing senses of place: Navigating global challenges. Cambridge University Press.</p> <p>1.6 Wilkinson, A., & Flowers, B. S. (2018). Realistic hope: Facing global challenges. Amsterdam: Amsterdam University Press.</p> <p>2. Journal Articles: Indicated above</p>		
Teaching Learning Strategies		
<p>This course makes use of interactive teaching and learning strategies which engage students to promote critical and reflective thinking, research and evaluation skills that will help them become better learners and enhance their skill set. Students will use personal and social capability to collaboratively work with others in learning activities, appreciate their own strengths and abilities and those of their peers, enabling them to develop a range of interpersonal skills such as communication, negotiation, teamwork, leadership and an appreciation of diverse perspectives.</p> <ol style="list-style-type: none"> 1. Lecturing 2. Class discussions 3. Guest speakers 4. Documentaries 5. Poster and power point presentations 6. Other innovative strategies suggested during sessions 		

Assignments: Types and Number with Calendar

The instructors may assign assignments, class tasks, research projects or presentations throughout the course to supplement the lectures and class discussions. The assignments will be graded and will contribute toward the formative assessment of the course. The instructors may decide upon the nature and calendar of the assignments to be completed during the course. The detailed course plan will be shared with the students in the first week of the semester.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.