

**Centre For High Energy Physics
Faculty of Science
University of the Punjab, Lahore
Course Outline**



Program	BSCP	Course Code	NHPY-120	Credit Hours	3
Course Title	The Science of Global Challenges				
Course Introduction					
Through this course, students will learn about and discuss some of the core challenges mankind is facing because of advancement in Scientific knowledge that has enabled us to harness nature's resources in various ways. The course also addresses scientific reasoning behind all these challenges and actions that must be taken to create a future free of these problems. Three main areas to focus on are suggested to be Climate Change, the Energy Crisis and the survival of humanity in the wake of deadly viruses and infectious diseases. Through this course, the students will get to see the complex relationship between Science, Technology and our Society and some future directions that promise a safer future for the humanity.					
Learning Outcomes					
On the completion of the course, the students will be able to: <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 will, 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, society and technology.					
Course Content				Assignments/Readings	
Week 1	Major advancements in the last 200 years				
	Associated challenges: Climate crisis, over reliance of fossil fuels and mass extinction of various species.				
Week 2	Greenhouse effect				
	Challenges and risks of climate change				
Week 3	Geological history, role of ocean currents in regulating global climate				
	Large scale wind patterns and global climate				
Week 4	Constraints by climate on ecosystems and impact of ecosystems on global climate				

	Projections of future climate	
Week 5	Measuring anthropogenic climate change	
	GCMs. Carbon emission and sustainability.	
Week 6	Science of energy	Halliday Resnick, Ch. 7
	Forms of energy, Energy conversion	Halliday Resnick, Ch. 8
Week 7	Sustainability of Energy Systems,	
	Working of renewable devices, renewable vs nonrenewable energy	
Week 8	Solar cells, Photoelectric effect	Halliday Resnick, Ch. 27, Sec 38-2
	Introduction to semiconductors	Halliday Resnick, Sec. 26-5
Week 9	Band gaps	Halliday Resnick, Sec. 41-1
	Wind energy, Wind mills	
Week 10	Physics of a generator	Halliday Resnick, Sec. 31-3
	Infectious diseases and their types	
Week 11	History of germs and vaccines	
	Evolution by natural and artificial selection	
Week 12	Species crossing by viruses	
	Antibiotic resistance	
Week 13	Human physiological limits	
	Changing interactions and new diseases	
Week 14	Complex web of science, politics and social systems, role of wars	
	Scientific funding	
Week 15	Technological progress and ethical constraints	
	Human experiences as Data	
Week 16	Nanotechnology and its applications in medicine, food, computational systems and energy	
	Biotechnology, future of agricultural production of food, genetic modification, gene therapy	
Textbooks and Reading Material		
Textbook. <i>“Fundamentals of Physics”</i> by Halliday, Resnick and Walker. Publisher: Wiley. Extended 10 th ed. 2018.		
Teaching Learning Strategies		

1. Asking students for what they have learnt and what do they think
2. Group activities
3. Using video resources
4. Reading suggested readings
5. Essay writing

Assignments: Types and Number with Calendar

Assessment

Sr. No.	Elements	Weightage	Details
4.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
5.	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.
6.	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.