

SDG Mapping - MS Chemistry Curriculum

The mapping of the 17 United Nations Sustainable Development Goals (SDGs) with the courses offered in the MS Chemistry program at the Pakistan Institute of Engineering and Applied Sciences (PIEAS) is presented in the following sections. The mapping has been developed in accordance with internationally recognized curriculum-mapping practices by aligning each course with the SDGs it most directly supports. To ensure a focused and evidence-based alignment, each course has been mapped to one primary SDG and, where applicable, up to two secondary SDGs based on its intended learning outcomes and course content.

1. SDG Mapping to Each Course of MS Chemistry Program

Course Code	Course Title	Primary Relevant SDGs	Justification
CY-590	Advanced Physical Chemistry	SDG 4, SDG 9	Fundamental scientific knowledge underpinning research and innovation.
CY-591	Topics in Advanced Inorganic Chemistry	SDG 4, SDG 9	Advanced inorganic chemistry supporting materials, catalysis and industrial innovation.
CY-600	Advanced Techniques in Chemistry	SDG 4, SDG 9, SDG 3	Advanced analytical instrumentation for research, diagnostics and technological development.
CY-574	Advanced Materials Chemistry	SDG 9, SDG 12, SDG 7	Development of advanced functional materials for sustainable technologies and industry.
CMS-501	Communication Skills	SDG 4, SDG 17	Scientific communication and collaboration skills.
CMS-511	Grooming & Self Discipline	SDG 4, SDG 16	Professional ethics, responsible citizenship and personal development.
CMS-112	Understanding of Quran-I	SDG 4, SDG 16	Ethical values, social responsibility and cultural understanding.
CMS-113	Understanding of Quran-II	SDG 4, SDG 16	Ethics, peace, tolerance and responsible citizenship.
NE-501	Fundamentals of Nuclear Engineering	SDG 7, SDG 9, SDG 13	Clean energy systems, nuclear technology and climate mitigation.
CY-504	Chemistry of Nuclear Fuel Cycle	SDG 7, SDG 9, SDG 12	Sustainable nuclear fuel management and advanced processing technologies.
CY-505	Radiation and Chemical Safety	SDG 3, SDG 12, SDG 16	Occupational health, environmental protection and chemical safety.
CY-500	Mathematics and Statistics for Chemists	SDG 4, SDG 9	Quantitative skills supporting scientific research and innovation.
CY-501	Atomic Spectroscopy	SDG 9, SDG 3, SDG 6	Advanced analytical methods for healthcare, materials and environmental monitoring.
CY-502	Chemistry of Synthetic Polymers	SDG 9, SDG 12	Polymer science supporting advanced manufacturing and sustainable materials.
CY-503	Advanced Chemistry Laboratory	SDG 4, SDG 9, SDG 6	Practical analytical competencies supporting research and environmental analysis.
CY-506	Electrochemistry	SDG 7, SDG 9, SDG 12	Batteries, corrosion science, electrochemical technologies and sustainable manufacturing.
CY-507	Separation Techniques	SDG 6, SDG 9, SDG 12	Water purification, membrane separations and industrial process optimization.
CY-510	Scientific Writing & Research Methodology	SDG 4, SDG 9, SDG 17	Research capacity, scientific integrity and knowledge dissemination.
CY-571	Artificial Intelligence in Chemistry	SDG 9, SDG 4, SDG 3	AI-driven scientific discovery, digital innovation and healthcare applications.
CY-572	Advanced Organic Chemistry	SDG 9, SDG 3	Advanced synthesis supporting pharmaceuticals and industrial chemistry.

Course Code	Course Title	Primary Relevant SDGs	Justification
CY-573	Computational Chemistry	SDG 9, SDG 7, SDG 3	Molecular modeling for materials, energy and drug discovery.
CY-580	Environmental Chemistry	SDG 6, SDG 13, SDG 12, SDG 15	Pollution control, climate action, environmental sustainability and ecosystem protection.
CY-582	Pharmaceutical Chemistry	SDG 3, SDG 9	Drug discovery, healthcare innovation and radiopharmaceutical sciences.
CY-601	Chemistry of Energetic Materials	SDG 9, SDG 12	Advanced energetic materials with emphasis on safe design and industrial applications.
CY-602	Synthetic Chemistry	SDG 9, SDG 12	Chemical synthesis supporting industrial production and sustainable processes.
CY-603	Membrane Science and Technology	SDG 6, SDG 7, SDG 9, SDG 12	Water purification, energy technologies and sustainable membrane processes.
CY-604	Polymer Additives and Blends	SDG 9, SDG 12	Advanced polymer engineering for sustainable industrial materials.
CY-605	Chemosensors and Biosensors	SDG 3, SDG 9, SDG 6	Biomedical diagnostics, environmental sensing and analytical innovation.
CY-606	Surface Chemistry and Catalysis	SDG 7, SDG 9, SDG 12	Catalysis for energy conversion, green chemistry and sustainable manufacturing.
MME-507	Characterization of Materials	SDG 9, SDG 4	Materials characterization supporting innovation and advanced manufacturing.
MME-623	Polymer Matrix Composites	SDG 9, SDG 12	High-performance composite materials for sustainable engineering applications.
CY-592	Special Topics in Chemistry-I	Variable (typically SDG 4 + discipline-specific SDGs)	Depends on selected topic.
CY-607	Special Topics in Chemistry-II	Variable (typically SDG 4 + discipline-specific SDGs)	Depends on selected topic.
CY-697	Thesis Research	SDG 4, SDG 9, SDG 17	Independent research contributing to scientific knowledge, innovation and collaboration.

2. Overall SDG Coverage of the MS Chemistry Program

SDG	Relevance	Major Contributing Courses
SDG 3 – Good Health and Well-being	High	Pharmaceutical Chemistry, Chemosensors, Radiation Safety, AI in Chemistry, Analytical Chemistry
SDG 4 – Quality Education	Very High	All core courses, Research Methodology, Communication Skills, Thesis
SDG 6 – Clean Water and Sanitation	High	Environmental Chemistry, Separation Techniques, Membrane Science, Analytical Laboratory
SDG 7 – Affordable and Clean Energy	High	Nuclear Engineering, Electrochemistry, Materials Chemistry, Catalysis, Computational Chemistry
SDG 9 – Industry, Innovation and Infrastructure	Very High	Nearly all chemistry, materials, AI, computational, polymer and analytical courses
SDG 12 – Responsible Consumption and Production	High	Environmental Chemistry, Materials Chemistry, Polymers, Catalysis, Radiation Safety, Membrane Science
SDG 13 – Climate Action	Moderate–High	Environmental Chemistry, Nuclear Engineering, Advanced Materials
SDG 15 – Life on Land	Moderate	Environmental Chemistry
SDG 16 – Peace, Justice and Strong Institutions	Moderate	Ethics, Radiation Safety, Institutional Requirement courses
SDG 17 – Partnerships for the Goals	Moderate	Communication Skills, Research Methodology, Thesis Research

3. SDG Terms and Definitions

SDG No.	SDG	Definition
SDG 1	No Poverty	End poverty in all its forms everywhere by ensuring equal access to economic resources, social protection, and basic services.
SDG 2	Zero Hunger	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture through resilient food systems.
SDG 3	Good Health and Well-being	Ensure healthy lives and promote well-being for people of all ages through improved healthcare, disease prevention, and medical innovation.
SDG 4	Quality Education	Ensure inclusive, equitable, and quality education and promote lifelong learning opportunities for all.
SDG 5	Gender Equality	Achieve gender equality and empower all women and girls by eliminating discrimination and ensuring equal opportunities.
SDG 6	Clean Water and Sanitation	Ensure the availability and sustainable management of clean water and sanitation for all through improved water quality, treatment, and conservation.
SDG 7	Affordable and Clean Energy	Ensure access to affordable, reliable, sustainable, and modern energy while increasing renewable and clean energy technologies.
SDG 8	Decent Work and Economic Growth	Promote sustained, inclusive, and sustainable economic growth, productive employment, and decent work for all.
SDG 9	Industry, Innovation and Infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster scientific research, innovation, and technological development.
SDG 10	Reduced Inequalities	Reduce inequality within and among countries by promoting social, economic, and political inclusion for all.
SDG 11	Sustainable Cities and Communities	Make cities and human settlements inclusive, safe, resilient, and environmentally sustainable.
SDG 12	Responsible Consumption and Production	Ensure sustainable consumption and production patterns through efficient resource use, waste reduction, pollution prevention, and circular economy practices.
SDG 13	Climate Action	Take urgent action to combat climate change and its impacts through mitigation, adaptation, education, and resilience-building.
SDG 14	Life Below Water	Conserve and sustainably use oceans, seas, and marine resources by reducing pollution, protecting ecosystems, and promoting sustainable fisheries.
SDG 15	Life on Land	Protect, restore, and sustainably manage terrestrial ecosystems, forests, biodiversity, and combat desertification and land degradation.
SDG 16	Peace, Justice and Strong Institutions	Promote peaceful and inclusive societies, provide access to justice for all, and build effective, accountable, and transparent institutions.
SDG 17	Partnerships for the Goals	Strengthen the means of implementation and revitalize global partnerships to achieve sustainable development through collaboration among governments, academia, industry, and civil society.